PRICE
10 CENTS

SAME PRICE
IN CANADA

MECHANIX ILLUSTRATED

MAY
1940

Volume XXIV
Number 1

Copyright 1940 by Fawcett Publications, Inc.

SPECIAL FEATURES

Airathon—What Is This Flying Sport? - - 34
By Maxwell Reid Grant

Chirpers Are Cured In Canary Clinic - - 40

He's Carving Himself A Future - - - - - 42

Goodby To Radio Static And Interference! - 44
By M. L. Muhleman

Of Men And Mushrooms - - - - - - - 50

Don't Walk On These Walls! - - - - - 53

Taking The Long Count! - - - - - - - 54
By Colin Kerr Cameron

He Models For His Little Men - - - - - 58

Crabbing His Act - - - - - - - - - - 60
By Ormal I. Sprungman

Folding Boat Is Real Amphibian - - - - 63

Cross-Examining Minerals Is His Hobby - - 66

Your Job—Aviation Mechanic - - - - - 68
By Donald G. Cooley

Ships That Never Go Down To Sea! - - - 74

150th Birthday Brings Memories To Patent Office - - - - - - - - - - 77

(Continued on page 6)

WHEN Beatrice Lillie, the British comedienne, redecorated her estate near London, she had the front door done to resemble a palm tree. Her friends were curious. "Why, it will confuse the German bombers," explained the irrepressible Miss Lillie. "When they see this, they'll think they're over Africa!"

A joke, yes. But there is no joke about the science of military camouflage these days, and experts are working day and night discovering new things about the art of hiding everything from machine-gun nests to ship yards and automobile factories. You can discover the latest developments in this strange art of making things "seem what they ain't" by reading "Mars Plays Hide and Seek" in the June issue of MI.

You'll also find a generous assortment of features, news shorts and how-to-build projects . . . all the things, in fact, that make MI what it is—the biggest dime's worth on the market!

The new MECHANIX ILLUSTRATED is on sale at all newsstands the first of every month.

Published monthly by Fawcett Publications, Inc., 11th Street and Broadway, Louisville, Kentucky. Executive Office—22 W. Putnam Avenue, Greenwich, Connecticut. Editorial and Advertising offices—1501 Broadway, New York, New York. Send subscriptions to the Louisville, Kentucky, or Greenwich, Connecticut, addresses.
Entered as second-class matter under the Act of March 3, 1879, at the post office in Louisville, Ky., with additional entry at Greenwich, Conn. Not responsible for unsolicited manuscripts. In U. S. and Possessions, 10c a copy; $1.00 a year. In Canada, 10c a copy; $1.50 a year. Other Postal Unions, $2.00 a year. Foreign subscriptions and sales should be remitted by International Money Order in United States funds, payable at Greenwich, Connecticut, U. S. A. East Indian Agent P. C. Eranee Sons, Bombay, India. Printed in U. S. A. Advertising forms close the first of second month preceding date of issue. Advertising offices: New York, 1501 Broadway; Chicago, 360 N. Michigan Ave.; San Francisco, Simpson-Reilly, 1014 Russ Bldg.; Los Angeles, Simpson-Reilly, Garfield Bldg. Member Audit Bureau of Circulations.

RALPH DAIGH, Managing Editor
ROBERT HERTZBERG, Editor
AL ALLARD, Art Director
CLIFF TAYLOR,
STANLEY GERSTIN,
ROLAND CUEVA,
GEORGE DANIELS,
Associate Editors

PRICE
10 CENTS

SAME PRICE
IN CANADA

MECHANIX ILLUSTRATED

MAY
1940

Volume XXIV
Number 1

Copyright 1940 by Fawcett Publications, Inc.

SPECIAL FEATURES

Airathon—What Is This Flying Sport? - - 34
By Maxwell Reid Grant

Chirpers Are Cured In Canary Clinic - - 40

He's Carving Himself A Future - - - - - 42

Goodby To Radio Static And Interference! - 44
By M. L. Muhleman

Of Men And Mushrooms - - - - - - - 50

Don't Walk On These Walls! - - - - - 53

Taking The Long Count! - - - - - - - 54
By Colin Kerr Cameron

He Models For His Little Men - - - - - 58

Crabbing His Act - - - - - - - - - - 60
By Ormal I. Sprungman

Folding Boat Is Real Amphibian - - - - 63

Cross-Examining Minerals Is His Hobby - - 66

Your Job—Aviation Mechanic - - - - - 68
By Donald G. Cooley

Ships That Never Go Down To Sea! - - - 74

150th Birthday Brings Memories To Patent Office - - - - - - - - - - 77

(Continued on page 6)

WHEN Beatrice Lillie, the British comedienne, redecorated her estate near London, she had the front door done to resemble a palm tree. Her friends were curious. "Why, it will confuse the German bombers," explained the irrepressible Miss Lillie. "When they see this, they'll think they're over Africa!"

A joke, yes. But there is no joke about the science of military camouflage these days, and experts are working day and night discovering new things about the art of hiding everything from machine-gun nests to ship yards and automobile factories. You can discover the latest developments in this strange art of making things "seem what they ain't" by reading "Mars Plays Hide and Seek" in the June issue of MI.

You'll also find a generous assortment of features, news shorts and how-to-build projects . . . all the things, in fact, that make MI what it is—the biggest dime's worth on the market!

The new MECHANIX ILLUSTRATED is on sale at all newsstands the first of every month.

Published monthly by Fawcett Publications, Inc., 11th Street and Broadway, Louisville, Kentucky. Executive Office—22 W. Putnam Avenue, Greenwich, Connecticut. Editorial and Advertising offices—1501 Broadway, New York, New York. Send subscriptions to the Louisville, Kentucky, or Greenwich, Connecticut, addresses.
Entered as second-class matter under the Act of March 3, 1879, at the post office in Louisville, Ky., with additional entry at Greenwich, Conn. Not responsible for unsolicited manuscripts. In U. S. and Possessions, 10c a copy; $1.00 a year. In Canada, 10c a copy; $1.50 a year. Other Postal Unions, $2.00 a year. Foreign subscriptions and sales should be remitted by International Money Order in United States funds, payable at Greenwich, Connecticut, U. S. A. East Indian Agent P. C. Eranee Sons, Bombay, India. Printed in U. S. A. Advertising forms close the first of second month preceding date of issue. Advertising offices: New York, 1501 Broadway; Chicago, 360 N. Michigan Ave.; San Francisco, Simpson-Reilly, 1014 Russ Bldg.; Los Angeles, Simpson-Reilly, Garfield Bldg. Member Audit Bureau of Circulations.

RALPH DAIGH, Managing Editor
ROBERT HERTZBERG, Editor
AL ALLARD, Art Director
CLIFF TAYLOR,
STANLEY GERSTIN,
ROLAND CUEVA,
GEORGE DANIELS,
Associate Editors

Read How These Men Got Better Jobs
THEN FIND OUT WHAT RADIO OFFERS YOU Mail Coupon

THESE MEN DID NOT GO TO COLLEGE

Read about the jobs they got and the money they make

I WORK ON RADIO PART TIME ONLY. I HAVE AVERAGED ABOUT $50 A MONTH.

JOHN B. MORRISSETTE
809 VALLEY STREET
MANCHESTER, N.H.

I AM NOW IN CHARGE OF THE RADIO DEPARTMENT OF AMERICAN AIRLINES AT CLEVELAND, OHIO.

WALTER B. MURRAY
MUNICIPAL AIRPORT
CLEVELAND, OHIO.

I MAKE $50 TO $60 A WEEK AND HAVE ALL THE RADIO WORK I CAN DO.

H.W. SPANGLER
126½ S. GAY STREET
KNOXVILLE, TENN.

I WAS WORKING IN A GARAGE WHEN I ENROLLED WITH N.R.I. I HAVE MADE AS HIGH AS $400 A MONTH IN RADIO.

E.G. WOLFE
ROUTE 1
BRISTOL, IND.

I HAVE BEEN IN BUSINESS FOR MYSELF FOR 18 MONTHS MAKING $200 TO $300 A MONTH.

ARLIE J. FROEHNER
224 WEST TEXAS AVE.
GOOSE CREAK, TEXAS

I will Train You at Home in your spare time for a Good Job in RADIO

J. E. SMITH, President
National Radio Institute
Established 25 years

Radio is a young, growing field with a future, offering many good pay spare time and full time job opportunities. And you don't have to give up your present job to become a Radio Technician. I train you right at home in your spare time.

Why Many Radio Technicians Make $30, $40, $50 a Week

Radio broadcasting stations employ engineers, operators, technicians. Radio manufacturers employ testers, inspectors, foremen, servicemen in good-pay jobs. Radio jobbers, dealers, employ installation and servicemen. Many Radio Technicians open their own Radio sales and repair businesses and make $30, $40, $50 a week. Others hold their regular jobs and make $5 to $10 a week fixing Radios in spare time. Automobile, police, aviation, commercial Radio; loudspeaker systems, electronic devices are other fields offering opportunities for which N.R.I. gives the required knowledge of Radio. Television promises to open good jobs soon.

Many Make $5 to $10 a Week Extra in Spare Time While Learning

The day you enroll, I start sending you Extra Money Job Sheets which start showing you how to do Radio repair jobs. Throughout your course I send plans and directions which have helped many make $200 to $500 a year in spare time while learning. I send special Radio equipment to conduct experiments and build circuits. This 50-50 training method makes learning at home interesting, fascinating, practical. I ALSO GIVE YOU A MODERN, PROFESSIONAL, ALL-WAVE, ALL-PURPOSE SET SERVICING INSTRUMENT to help you make money fixing Radios while learning and equip you for full time work after you graduate.

Find Out What Radio Offers You Mail Coupon Below

Act Today! Mail the coupon for my 64-page Book, "Rich Rewards in Radio." It points out Radio's spare time and full time opportunities and those coming in Television; tells about my Course in Radio and Television; shows many letters from men I have trained, telling what they are doing and earning. Read my money back agreement. MAIL COUPON in an envelope or paste on a penny postcard—NOW!

J. E. Smith, President
Dept. OEH, National Radio Institute
Washington, D. C.

MAIL NOW · Get 64 page book FREE

J. E. SMITH, President, Dept. OEH,
National Radio Institute, Washington, D. C.

Dear Mr. Smith: Mail me FREE without obligation, your 64-page book, "Rich Rewards in Radio," which points out Radio's opportunities and tells how you train men at home to be Radio Technicians. No salesman will call. (Write or print Plainly.)

Name..... Age....

Address .....

City..... State.....

INVENTORS

these Free Books tell

How To Protect And To Profit From Your Ideas ● *How You Can Save Time & Money*

● Here are the facts you need. Competent advice on patent procedure is essential to good results. Our 65 years of experience enable us to clearly explain everything you need to know about protecting and commercializing your idea. Write today—just request our free booklets and special "Certification of Invention" form (for your protection). Prompt service and best results.

MAIL NOW FOR FREE BOOKS

C.A. SNOW & CO.

Registered Patent Attorneys Since 1875

Dept. 305, SNOW BUILDING, WASHINGTON, D. C.

Gentlemen: Please send me absolutely free and without obligation on my part, your original document "Certification of Invention" together with your two guides for Inventors, "How We Protect You" and "Suggestions On How to Commercialize Your Invention."

Name .....

Street and No. .....

City or Town ..... State .....

Inventions Wanted
Patented or Unpatented

We have been successfully selling inventions, patented and unpatented, since 1924. Write for proof, and tell us what you have for sale.

CHARTERED INSTITUTE of AMERICAN INVENTORS
Dept. 5, Barrister Building Washington, D. C.

INVENTORS:

I GET MY NEW FREE BOOK. Use my personal, confidential patent service. Send for free facts on patenting your invention. Also suggestions on financing a patent application. Reasonable fees. Deferred payment arranged. Write HUGH E. McMORROW, Registered Patent Attorney, Dept. 322-F, Barrister Building, Washington, D. C.

INVENTORS
BE SUCCESSFUL

Read Invention & Finance—it's your chance to make money. Free particulars concerning contents of magazine given to prospective subscribers. Cut out and send us this advertisement to receive your particulars.

INVENTION & FINANCE MAGAZINE
80-H Wall Street, New York, N. Y.

CONTENTS—Continued from page 4

DEPARTMENTS

Chips From The Editor's Workbench - - - 10
Through The Periscope - - - - - - - - 26
You're Right—That's Wrong! - - - - - - 65
Amateur Photo Puzzlers - - - - - - - - 114

AVIATION

Army's Latest Fighting Plane - - - - - 39
Engine Pre-Heater Saves Time - - - - - 48
Latest Thing In Transports - - - - - - 64
Fire Fighter For Planes Perfected - - - - 64
The Hawk Hatches Hard-Boiled Eggs - - - 67

NEW MECHANICAL DEVICES

Machine Vends Electric Shaves - - - - - 39
Spray Gives Imitation Tan - - - - - - - 39
Trick Engine Runs Two Ways - - - - - 43
Paddle Or Pillow, Take Your Pick - - - - 43
Finger Gadgets Provide Nail Protection - - 49
Polaroid Film Makes Reading Easier - - - 49
New Magnet Has Medical Use - - - - - 52
Clock Has Three-Dimensional Face - - - 59
Eye Machine Accelerates Reading - - - - 59
New Electrical Pencil Sharpener - - - - 62
Pistol Grip Rod Will Please Anglers - - - 64
New Type Of Cruiser Is Launched - - - - 67
"Snow Whites" To The Rescue - - - - - 76
New Belt Teaches Swimming - - - - - 76

PHOTOGRAPHY

Build This Pin Hole Camera - - - - - - 78
By Henry and Karl Dittmer
Amateur Photo Puzzlers - - - - - - - - 114

MISCELLANEOUS

Giant Locomotive Is Headed For Brazil - - 48
Some People Would Rather Take Chances - 48
Indiana Prisoner Builds Pipe Organ - - - 49
That's A Big Bite! - - - - - - - - - - 52

(Continued on page 8)

- 10
- 26
- 65
- 114

- 39
- 48
- 64
- 64
- 67

ES

- 39
- 39
- 43
- 43
- 49
- 49
- 52
- 59
- 59
- 62
- 64
- 67
- 76
- 76

78

114

48
48
49
52

INVENTORS

Facts About How to Obtain PATENTS and Market Inventions

Get FREE COPY

If you have invented something, if you are interested in inventing something, you need our new 48-page book that gives the entire Story of Patents. It tells you for the first time about new phases of invention, how others succeeded, how the patent laws protect you, how to market your invention, where to obtain finances, how to form a company, partnership, or arrange for royalties from your invention's sale.

BE SURE TO PROTECT YOUR RIGHTS

The U. S. A. is the greatest open market for new inventions in the world. Here commercial striving is so keen that the unprotected invention, if it has public acceptance, is quickly "eyed" and may become the prey of eager competition. Worthwhile manufacturers will not bear the production costs and sales expense of promoting a new invention unprotected by patent. A good, strong patent not only opens the road to marketing your invention, but closes it to would-be chiselers who may seek to reap the rewards of your creative efforts.

FREE FORM FOR RECORDING INVENTION

When you send for our FREE BOOK, we include, also Free, our specially prepared Record of Invention blank, on which you can quickly make and date a sketch and description of your invention. This "disclosure" as it is called, may be absolutely invaluable as evidence for you, should your rights ever be contested. Be sure to get it and use it.

LET US HELP YOU WITH YOUR PATENT

During the past twenty years we have helped great numbers of inventors secure their U. S. Patents. We know the pitfalls and how to avoid them. We have trained, experienced patent draftsmen and registered patent attorneys ready to serve you—and each one, when he undertakes to handle your case, realizes that he is personally responsible to contribute the fullest individual effort possible.

GET FREE BOOK—MAIL COUPON NOW

Know exactly what you should do to secure a Patent—what must be done every step of the way—how the Patent Law protects you—what we, as Registered Patent Attorneys, can do for you. Mail the above coupon NOW for our Big Book and Record of Invention Form.

48 PAGES
Over 100 Illustrations

Get This **FREE BOOK**
IMMEDIATELY MAIL COUPON TODAY!

Clarence A. O'Brien
Registered Patent Atty.
OE3 Adams Building
Washington, D. C.

CLARENCE A. O'BRIEN

Registered Patent Attorney
OE3 Adams Building
Washington, D. C.

Please send me your 48-page "Patent Guide" FREE. Also specially prepared "Record of Invention" Form. This request does not obligate me.

Name .....

Address .....

City ..... State .....

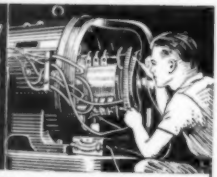
(Please write or print plainly)

PREPARE FOR A GOOD JOB OR A BUSINESS OF YOUR OWN IN

ELECTRICITY

LET ME SHOW YOU HOW WE TRAIN YOU FOR YOUR START IN THIS FASCINATING FIELD-12 WEEKS TRAINING!

"LEARN BY DOING"



Here at the big Coyne Shops in Chicago we train you for your start in the fascinating, profitable field of Electricity on **real** equipment — real motors, generators, auto and airplane ignition systems. First the instructor shows you **how** . . . then you **do the job yourself.** Not a correspondence or home study course . . . 12 weeks' actual shop training in Electricity. I am now including **an extra 4 weeks' course in radio at no extra cost.**

I'LL FINANCE YOUR TRAINING

You can get this training NOW . . . start anytime . . . then pay for most of it in 10 monthly payments — beginning 60 days after you graduate. Mail coupon today for big illustrated book showing how students train in my Chicago shops. Book also tells about my "Pay After Graduation Plan", tells about my low board and room plan and helps you get a part-time job while training, if needed, tells about my "Job After Graduation Service", etc. Train for Electricity's Big Opportunities NOW.

H. C. Lewis

COYNE ELECTRICAL SCHOOL

GET BIG FREE BOOK

EXTRA 4 WEEKS COURSE IN RADIO INCLUDED

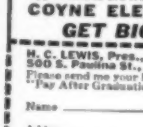
H. C. LEWIS, Pres., COYNE ELECTRICAL SCHOOL
500 S. Paulina St., Dept. 50-53, Chicago, Ill.
Please send me your big free book and details of your "Pay After Graduation" and other plans.

Name _____

Address _____

City _____ State _____

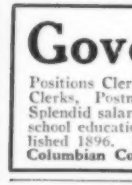
ATTENTION MOTOR REPAIRMEN!



You need this book of over 600 brand new A. C. Motor Diagrams, Tables, and Controller Connections. The material is designed especially to enable the practical electrician to better understand the various types of electric motors now in use. In the contents you will find: All standard single, two, and three phase circuits up to 12 path presented in a simplified form; A practical means for converting windings for a difference in voltage, phase, speed, or frequency; special dual voltage and multi-speed connections; the circuits, adjustments and repair of split phase, capacitator, series, and repulsion induction motors; means of testing motors for horse power; and numerous important tables. A more complete knowledge of motor circuits will place you in a position of greater earning ability. Send for your copy today! This book guaranteed satisfactory or your remittance promptly refunded. Price $2.00 prepaid.
Dept. MI, EDUCATIONAL ADVANCEMENT COMPANY, Lakewood, N. Y.

Government Jobs

Positions Clerk Carriers, Rural Carriers, Railway Postal Clerks, Postmasters, File Clerks, and many others. Splendid salaries, easy work, vacation with pay. Common school education sufficient. Examinations often. Established 1896. Send for our Civil Service Catalog No. 9.
Columbian Correspondence College, Washington, D. C.



HOUSE WIRING
EASILY UNDERSTOOD

NEW! COMPLETE *and* *Up-to-the-Minute* Book

Covers in detail all phases of practical wiring for homes, garages, farm buildings, etc. Fuses, circuits, switches, installation plans explained and described in simplest language with wiring diagrams. 200 illustrations. Cloth binding.

SEND NO MONEY
Just pay postman $1.50 plus small c.o.d. charges. If not completely satisfied, return in 5 days and money will be refunded. Postage prepaid if you send cash in advance.

FREE Catalog of practical books on Painting; Decorating; Commercial Art; Sheet Metal; Welding; Radio; Electricity; Diesel Engines; Carpentry; Plumbing; Heating and Ventilating.

FRED'K J. DRAKE & CO.
199 N. Michigan Ave., Chicago
Drake's Books Sold at All Good Book Stores

CONTENTS—Continued from page 6

His Hobby Hit "Pay Dirt" - - - - - - - 52
She Looks A Little Nervous - - - - - - - 59
It's No Fun For The Fish - - - - - - - - 62
Stretcher Carrier Does Double Duty - - - - 62

HOW TO BUILD SECTION

Introduction - - - - - - - - - - - - 80
Hurricane Lantern For The Porch - - - - 81
For Dogs Only! - - - - - - - - - - - 84
Cocoanuts To You! - - - - - - - - - - 88
The "Mighty Mite" - - - - - - - - - - 90
A Hand Made Hunting Knife - - - - - - 93
Special Table Tennis Paddles - - - - - 93
Hints For The Spring Gardener - - - - - 94
The Modern Farm Shop - - - - - - - - 96
Auto Kinks - - - - - - - - - - - - 101
Dress Up Your Flower Pots - - - - - - 102
Totem Pole Smoking Stand - - - - - - 103
Wood Chain Lawn Fixture - - - - - - 103
Kinks For Boat Owners - - - - - - - 104
Flagpole For The Beach Home - - - - - 106
Roll-About Cocktail Table - - - - - - 107
Cordova Coffee Table Easy To Make - - - 107
Pencil Sharpener Champfers Copper Tubing - 108
Gauge Countersinks Screws - - - - - - 108
Repairing Gears - - - - - - - - - - 108
For Accurate Drilling - - - - - - - - 108
Build An Adobe Bird House - - - - - - 109
A Sheep's Bell For The Door - - - - - 109
Melodious Pipe Chimes - - - - - - - 109
Miniature House and Garden - - - - - 110
Photography Kinks - - - - - - - - - 112
Roll-Up Diffusers For Floodlights - - - - 113

Plan Your Future

Choose Your Field NOW For Success

Will you master fate or will fate master you? That's a question deserving your honest answer... right now! Actually it is largely up to you. You can do with Life almost what you will. LaSalle will help you establish yourself for real success by providing you with the comprehensive, specialized training for which it is so famous. Choose your field . . . now! Check the coupon below for the free booklet you want us to send you. It can be your first step toward assured success.

Opportunities in Traffic Management

The field of Traffic Management offers real opportunity only to the man who knows. Spare time study and the will to succeed have pushed scores of Traffic employees up the ladder to financial success. Many LaSalle-trained traffic managers—in the railroad, truck and industrial field—now command salaries of $3,000.00 to $5,000.00 a year—and better. Investigate. Find out how you can qualify for these higher positions through LaSalle home-study and guidance.

Law for Business Success

And it isn't necessary to practice law to get this Success. In fact probably most of the men who study law today have no idea of taking the bar examination or becoming lawyers—they want law training to help them master men and situations in business. You know that—

(1) the man with legal training is a leader—not a follower.

(2) legal training keens your mind—clears away the problems that stump the ordinary fellow and makes you master instead of man.

(3) knowledge of law simplifies the complications of executive work.

(4) Many top executive places are filled by men who have studied law.

No matter whether you are in a big corporation or a small business—in a city or a little town—a practical knowledge of law can hardly fail to be of real and vital help to you in making a more successful career.

In every state in the union you'll find law-trained men who came up through LaSalle. What others have done, you can do.

And LaSalle offers either a full law course leading to LL. B. or a shorter business law training—whichever you prefer. All text material, including valuable 14-volume Law Library. Training comprises the most effective features of modern law instruction.

Executive Training

Executives who are efficient managers command responsible positions and good incomes. And the need for trained executives is growing rapidly. We train you thoroughly at home in your spare time for every type of executive work—teach you the principles and practices used by our most successful business leaders and help you develop your management capacity—by a training built with the aid of outstanding executives.

Become an Expert Accountant *The Profession That Pays*

The demand for skilled accountants—men who really know their business—is increasing rapidly. New state and federal legislation requires much more, and more efficient accounting from business—big and small. Corporations are in constant need of expert counsel in matters relating to Auditing, Cost Accounting, Business Law, Organization, Management, Finance. Men who prove their qualifications in this important branch of business are rapidly promoted to responsible executive positions—given an opportunity to earn real salaries. The range is from $2,000.00 to $10,000.00 a year—even to higher income figures.

Under the LaSalle Problem Method you can at home acquire a thoro understanding of Higher Accountancy, master its fundamental principles, become expert in the practical application of these principles—this without losing an hour of work or a dollar of pay.

Your training will be under the direct supervision of a staff of legal, organization and management specialists, business efficiency engineers and Certified Public Accountants.

Preliminary knowledge of bookkeeping is unnecessary. We train you from the ground up, or from where you now are, according to your individual needs.

Mr. Salesman: *What's Wrong?*

Why aren't you making more sales—more money? Is it you—or your proposition? Check up first on yourself. Other men—no better than you—have found their earnings jump and stay up when they trained with LaSalle. Literally thousands of men—many of them years at the game—have increased their sales volume and earnings through home study with LaSalle guidance. Sound—practical—usable—right from field experience. Train for top-notch production with LaSalle.

LASALLE EXTENSION UNIVERSITY A CORRESPONDENCE INSTITUTION Dept. 5493-R, Chicago

I would like to have your special booklet—without any cost or obligation to me—about my opportunities and your success training in the business field I have checked.

☐ Higher Accountancy	☐ Commercial Law	☐ Business English
☐ Law: Degree of LL.B.	☐ Expert Bookkeeping	☐ Business Correspondence
☐ Traffic Management	☐ C. P. A. Coaching	☐ Effective Speaking
☐ Modern Salesmanship	☐ Industrial Management	☐ Stenotypy
☐ Business Management	☐ Modern Foremanship	

Name..... Age.....

Position..... Address.....

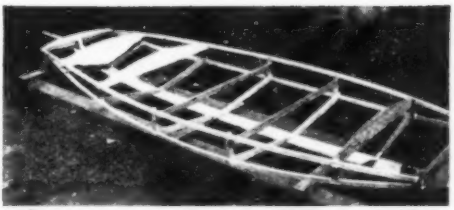
CHIPS *from the* EDITOR'S WORKBENCH

Kid Stuff

THE administration of America's No. 1 airport, La Guardia Field, has now reached the silly stage. It's hard to believe, but New York's Department of Docks, which runs the field, actually sent the War Department a bill for $20.00 because an Army transport landed there recently! Private fliers have boycotted the field since a minimum landing fee of $5.00 was established a few months ago, and now both the Army and the Navy are joining them in protest against this ridiculous practice by prohibiting their pilots from using the airport until further notice. No other municipally-owned field in the country charges landing fees.

Military officials are particularly furious about the whole business because they went to a lot

[*Continued on page* 12]



Once again a boat builder wins the $5.00 first prize for "Workbench" pictures. Here are some snapshots of the 11-foot "Little Bear" built from MI plans by Gordon McDermaid, of Salt Lake City, Utah. The top picture shows the simple construction, and the bottom one the finished job afloat.

"The boat is very stable in rough water," writes Mr. McDermaid, "and we have plenty of rough water here on the Great Salt Lake. Because of its ease of construction, five other boats of this type are under construction and will be sailing on the Lake this summer. My whole boat cost only about $50.00."

Excellent blueprints of "Little Bear" are available for $1.50 postpaid. If you have never built a boat before and want to start on something simple, inexpensive and reliable, this is it!

With great sorrow we record the passing of Capt. W. H. Fawcett, founder and publisher of MECHANIX ILLUSTRATED and nineteen other magazines.

Capt. "Billy," as he was known to his numerous friends all over the world, was truly a self-made man, who found life an exciting adventure and enjoyed it to the fullest. At the age of 16 he left his home in Minneapolis, Minn., to join the Army, and saw immediate service in the Philippine Insurrection. In a battle with the mad Moros he suffered a dangerous leg wound from which he nearly didn't recover.

Honorably discharged from the Army, he returned to Minneapolis and got into newspaper work when a latent talent for writing came to light more or less accidentally. Then the United States entered the World War and he re-enlisted in the Army, emerging as an officer with the rank of captain. His pungent writings became highly popular, and Capt. Fawcett became a full-fledged publisher. One success followed another, until today the Fawcett magazines enjoy a monthly circulation running in the millions.

Capt. "Billy" had a strong feeling for scientific developments, and this magazine was one of his favorites from its start in 1928. He foresaw the growth of aviation, and, himself, was an active private flier during the post-war period when flying was a really hazardous hobby. He was also internationally famous as a shooter, and was captain of the 1924 Olympic trap shooting team.

A frank man-to-man talk about PATENTS—INVENTIONS and SELLING INVENTIONS

The world of invention moves on. Yet about fifty years ago, some people were saying, "Well, there isn't much left to invent." Today we know that is one of the funniest things ever said. Just think what has happened in the last fifty years! Autos, radios, airplanes and thousands of useful, practical devices for home, shop and office have been put on the market. Inventors are constantly making the world a better place to live in.

Interesting examples: Hans Wach, an obscure worker, invented a simple device to utilize exhaust steam on ships. A report states that *already steamship lines have saved more than $15,000,000 on fuel bills with his invention.* The Department of Commerce has announced that it will test out a new airplane. The inventor states that the average man can learn to fly in a day; that it will travel at the rate of 110 miles an hour and will sell at the price of a cheap automobile. Seattle man invented a robot to go 5,000 feet under the sea and recover millions and millions of dollars worth of gold lying at the bottom of the ocean since the days of the early Spaniards.

LITTLE IDEAS MAY HAVE BIG COMMERCIAL POSSIBILITIES!

But remember this: For every outstanding, big invention, there are thousands of small, simple things for use in the home, office, factory, on the farm, on every sort of conveyance. Little articles like you find on the counters of a 10-cent store, hardware store, drug store, toy and novelty shop. A person finds something that doesn't work right, or it's clumsy or costs too much. He gets a happy thought. He improves the old article. That's a contribution to human progress. That's the way that many, many men have reached the goal of financial comfort, independence and even wealth. Most of the things we use today didn't come from the brains of engineers and physicists. They came from the mind and perhaps the crude home workbench of Mr. Average Man, busily engaged in earning his bread and butter at whatever chance or circumstance has given him to do. The "LITTLE" MAN'S OPPORTUNITY AS AN INVENTOR WAS NEVER GREATER THAN IT IS TODAY.

OUR BUSINESS IS TO HELP YOU— *WRITE TO US TODAY!*

For more than forty-two years, this firm has been helping men with an inventive turn of mind. We maintain a large staff of experienced specialists—REGISTERED PATENT ATTORNEYS, PATENT DRAFTSMEN and PATENT OFFICE SEARCHERS—to help our clients secure all the protection to which they are entitled. Fees are reasonable. Deferred payments frequently arranged. Your questions will be answered promptly.

You may write us frankly, knowing that what you say will be held in strictest secrecy . . . But FIRST, send for the FREE books shown on this page. They tell you things about Patents, Inventions and Selling Inventions that we have learned in our long experience. They may save you time, expense and EVEN LATER DISAPPOINTMENT. Simply fill in the coupon. No charge, no obligation. Write us today.

2 FREE BOOKS
WITH 68 PAGES OF FACTS AND PICTURES

VICTOR J. EVANS & CO.
REGISTERED PATENT & TRADEMARK ATTORNEYS

MAIN OFFICE: 580-E VICTOR BUILDING
WASHINGTON, D. C.
Pittsburgh Office: 514-B Empire Building

Gentlemen: Kindly send me at once FREE copies of your books, "Patent Protection" and "Selling an Invention". Also include a FREE copy of your "Evidence of Invention" form.

Name .....

Address .....

Place and State.....

INVENTORS
PATENT YOUR IDEAS
SEND FOR FREE BOOK →

HOW TO OBTAIN A PATENT

Written by a Former Member of the Examining Corps (1922-24) of the U.S. Patent Office. If you want to profit by your idea, you should take steps to apply for a U. S. Patent at once. Your first step is to get this Free Book. This interesting illustrated book contains valuable information you should have. It tells you fully how to obtain a patent on your idea in the quickest way. With this Free Book you will also receive a "Record of Invention" form on which you can easily record your idea. Personal and Confidential Service: Your case will be personally handled only by a Registered Patent Attorney who is also a Former Member of the Examining Corps of the U. S. Patent Office. All communications confidential.

MAIL COUPON TODAY for FREE PATENT BOOK and RECORD OF INVENTION Form

CARL MILLER
REGISTERED PATENT ATTORNEY
FORMER MEMBER EXAMINING CORPS U. S. PATENT OFFICE

Woolworth Bldg., 35th Floor, Dept. 50-B, New York City
MILLER BUILDING, Dept. 50-B, WASHINGTON, D. C.
Please send me your Free Book, "How to Obtain a Patent," and your "Record of Invention" form.

NAME .....

ADDRESS .....

WANTED INVENTIONS

WE LOCATE BUYERS for and have many requests from manufacturers for New Inventions of merit, Patented or Unpatented, Cash or Royalty. If will sell, write us today for a FREE PROTECTIVE DISCLOSURE FORM, Descriptive Booklet, References and Full Particulars of our services to inventors. NO OBLIGATION. A post-card will do! Address:

THE INVENTION REPORTER
2E-11236 So. Fairfield Ave., Chicago, Ill.

PATENTS
PERSONAL SERVICE

My *Personal* service assures strictest confidence on all your patent problems. Send me a model or drawing, or sketch and description of your invention, and $5.00. I will make a search and report promptly as to its patentability and send you a copy of my 72-page booklet. Or, if you prefer to read my booklet first, write today for FREE copy. Registered Patent Attorney.

L. F. Randolph, 761 Victor Building, Washington, D. C.

Learn Photography at HOME

Splendid opportunities. Prepare quickly in spare time. Easy method. No previous experience necessary, common school education sufficient. Many earn while learning. Send for free booklet "Opportunities in Modern Photography", particulars and requirements.
AMERICAN SCHOOL OF PHOTOGRAPHY
3601 Michigan Avenue Dept. 2055 Chicago, Illinois

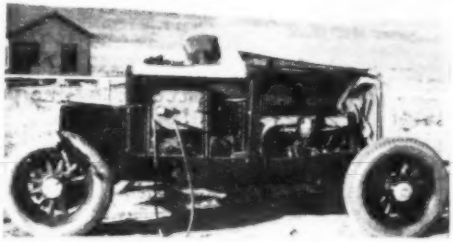
HAVE YOU SOME SPARE ROOM

a basement or garage where you can do light work? We can offer you a profitable proposition, casting 5 and 10c Novelties, Ashtrays, Toy Autos, etc., as manufacturer for firm of many years standing. No experience necessary as we furnish full instructions with moulds. If interested in devoting spare or full time to profitable work write AT ONCE stating age and space available as we are now closing arrangements for 1940 supply of our goods.

METAL CAST PRODUCTS CO. Dept. 2
1696 Boston Road New York, N. Y.

Editor's Workbench Chips

[*Continued from page* 10]

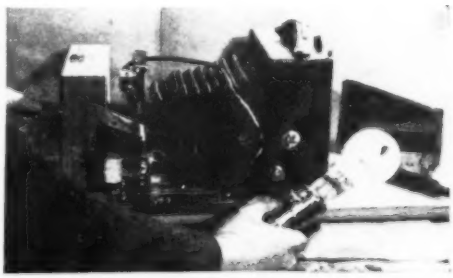


This husky welding outfit was made entirely by John E. Scully, of Loyd, Colo., who used old or discarded equipment that he picked up in junk yards. It delivers up to 500 amperes, and he uses it very successfully for repairs on heavy oil-well machinery. The generators are driven by a revamped Hupp engine, vintage 1931. The outfit is used as a trailer, and is always ready to be hauled away for quick jobs.

of expense and trouble to provide a spectacular air circus on the opening day of LaGuardia Field. And New York shows its appreciation by charging the Federal Government for the privilege of using the same field for routine landings! City officials are calmly ignoring the fact that about $25,000,000 of Federal funds went into the $40,000,000 project, and they are merely saying that New York is an independent corporation and will run the field as it sees fit.

The uncomplaining taxpayers whose money really paid for the whole works can't even get in to see LaGuardia Field without paying an extra penalty. Both ends of the big observation ramp are now fitted with subway-type turnstiles, into which you must deposit a dime in order to be admitted! Parking the family car costs another quarter. You come away from the field boiling

[*Continued on page* 14]



"It works swell!" This is the enthusiastic comment of L. A. Styles, of San Francisco, Cal., on the photoflash synchronizer tester which was featured in GOOD PHOTOGRAPHY No. 2. It cost him nothing, as he had on hand the necessary scraps of wood and small mirrors. The light-tight box which holds the bromide paper (on which the test exposures are made) is nothing but an old cigar box. With his camera shutter and synchronizer adjusted properly, as indicated positively by this tester, Styles never has to worry about missing flash pictures. He'll receive $3.00 for this snapshot.

Promotion Begins at Home

If you are an average grade school graduate, the average man with High School training earns $16.30 a week MORE than you.

YESTERDAY— **TODAY—**

In 1900 . . . Many doctors then practicing were not even high school graduates. High School had not been required at the time they entered medical school.

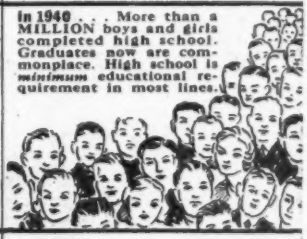
In 1940 . . . Schools of nursing require high school graduation because most of them are conducted at *college* level. Progress has made modern nurses' training equal or superior to that available to many old time doctors.

The Wright brothers, long months after they actually had accomplished flight, still were baffled by the problem of how to turn a plane while it was flying. (1904)

Thousands of schoolboys 14-16 years of age know more today about airplane design than the Wrights knew at Kitty Hawk.

In 1900 . . . The High School Graduate was a person of distinction. Only *one* person in 800 had finished high school.

In 1940 . . . More than a MILLION boys and girls completed high school. Graduates now are commonplace. High school is *minimum* educational requirement in most lines.



In 1900 . . . Very few even thought of going to college, unless to enter one of "the learned professions." The number of college graduates in business and industry was so few that they formed practically NO COMPETITION in the average job.

In 1940 . . . Almost exactly as many are being graduated from college, today, as from high school 40 years ago. Everywhere—in everything you do—in commerce, industry, personal affairs, you are up against the competition of COLLEGE GRADUATES.

In 1900 . . . The "little red schoolhouse" did a pretty fair job of equipping men and women to make their way in the world.

To Get Ahead Today You MUST Finish High School

Alice in Wonderland learned: *"You must run as fast as you can in order to stay where you are. To get anywhere, you must run TWICE that fast."*

Your own life, today, is like that. During the day, you must try as hard as you can—as well as you can—in order to be sure of holding what you already have. To get anywhere in commerce, industry or socially—to win a better job—bigger pay—greater success in your social activities—you must make EXTRA effort in your SPARE time to meet the competition of better educated people.

Do you want

- **. . to go to College?**
- **. . or to enter a Profession?**

(*Such as Accounting, Architecture, Nursing, Dentistry, Teaching, Social Work, Osteopathy, Beauty Culture, Optometry, Embalming, Chiropody, Law, Medicine, etc.*)

- **. . or get an Office Position?**

To get anywhere, you practically MUST finish High School FIRST. You can complete our simplified High School Course in SPARE time at home, as FAST as your time and abilities permit. **MANY FINISH IN 2 YEARS.** Equivalent to resident school work—prepares you for college, pre-professional examinations, business, industry. Standard texts furnished. Diploma. Credit for H. S. subjects already completed. Single subjects if desired. Low tuition, easy terms. American School, Chicago, est. 1897—endorsed by educators. Finish your high school education NOW. Write TODAY!

American School, Dept. H-528, Drexel Ave. at 58th St., Chicago, Illinois

Gentlemen: I'll sit down and consider my Promotion Problems carefully if you will send me FREE information covering subject checked. No obligation.

☐ HIGH SCHOOL COURSE	☐ Radio and Television	☐ Business Management
☐ Diesel Engineering	☐ Salesmanship	☐ Aviation
☐ Drafting and Design	☐ Air Conditioning	☐ Electrical Engineering
☐ Liberal Arts	☐ Accounting and Auditing	☐ Electrical Refrigeration
☐ Private Secretary	☐ Architecture and Building	☐ Business Law
☐ Mechanical Engineering	☐ Automotive Engineering	☐ Retail Merchandising

Name .....

Address .....

Spare Time Training Can Help You in Your Work—and Socially

GUARANTEED TIRES!
GOODYEAR-GOODRICH FIRESTONE-U.S. and Other Standard Makes

FREE! LANTERN With Every 2 Tires ordered

Complete with batteries and newest type reflector bulb. Ready for instant use. Strong, steady light. Useful everywhere. Order now.

$2.15 29x4.40-21

World's Lowest TIRE PRICES

Tire users by the thousands all over the U.S.A. vouch for the Long Hard Service of our Standard Brand tires reconditioned with high grade materials and latest methods by our tire experts. Our 21 years experience makes it possible to offer tires at lowest prices, with legal agreement to replace at ½ price any tire that fails to give 12 Mos. Service.

EVERY TIRE GUARANTEED!

BALLOON TIRES

Size Rim	Tires	Tubes
29x4.40-21	$2.15	$1.05
29x4.50-20	2.35	1.05
30x4.50-21	2.40	1.15
28x4.75-19	2.45	1.25
29x4.75-20	2.50	1.25
29x5.00-19	2.65	1.25
30x5.00-20	2.85	1.25
6.25-17	2.90	1.35
28x5.25-18	2.90	1.35
29x5.25-19	2.95	1.35
30x5.25-20	2.95	1.35
31x5.25-21	3.25	1.35
6.50-17	3.35	1.40
28x5.50-18	3.35	1.40
29x5.50-19	3.35	1.45
6.00-17	3.40	1.40
30x6.00-18	3.40	1.40
31x6.00-19	3.40	1.45
32x6.00-20	3.45	1.55
33x6.00-21	3.55	1.55
32x6.50-20	3.75	1.75
6.00-16	3.75	1.45

REGULAR CORD TIRES

Size	Tires	Tubes	Size	Tires	Tubes
30x3½	$2.35	$0.95	33x4½	$3.45	$1.45
31x4	2.95	1.25	34x4½	3.45	1.45
32x4	2.95	1.25	30x5	3.65	1.65
33x4	2.95	1.25	33x5	3.75	1.75
34x4	3.25	1.35	35x5	3.95	1.75
32x4½	3.35	1.45			

HEAVY DUTY TRUCK TIRES
(High Pressure)

Size	Tires	Tubes	Size	Tires	Tubes
30x5	$4.25	$1.95	34x7	$10.95	$4.65
32x5	4.95	1.75	38x7	10.95	4.65
34x5	4.25	2.25	36x8	11.45	4.95
32x6	7.95	2.95	36x8	11.45	4.95
36x6	9.95	4.45	40x8	13.25	4.95

TRUCK BALLOON TIRES

Size	Tires	Tubes	Size	Tires	Tubes
8.00-20	$3.75	$1.65	7.50-20	$6.95	$3.75
8.50-20	4.45	1.95	8.25-20	8.95	4.95
9.00-20	5.95	2.95	10.00-20	10.95	5.65
ALL OTHER SIZES			9.75-20	13.95	6.45

DEALERS WANTED

SEND ONLY $1.00 DEPOSIT on each tire ordered. ($3.00 on each Truck Tire.) We ship balance C. O. D. Deduct 5 per cent if cash is sent in full with order. To fill order promptly we may substitute brands if necessary. ALL TUBES BRAND NEW—GUARANTEED—

PERRY-FIELD TIRE & RUBBER CO.
2328-30 S. Michigan Av., Dept. 5609, Chicago, Ill.

Learn MECHANICAL DENTISTRY

A profession offering unlimited opportunities. Most modern and complete course embracing every branch from Plate to Porcelain Work, which prepares you to work for Dentists or start your own business. Individual instruction—practical training in day or night school. No books—no classes. Catalog upon request.

McCARRIE SCHOOL OF MECHANICAL DENTISTRY
207 N. Broad St. Dept. 910 Philadelphia, Pa.

MONEY for MEN ALL DATA **FREE**

THE PLASTEX Industry needs manufacturers on small scale and for big production of Lamp and Clock Stands, Art Goods and Novelties in Plastex and Marble imitation. Experience unnecessary. The material makes regular 10c store sellers. Rubber molds furnished for speed production. Small investment brings big returns. BIG CHAIN STORE Orders now being placed. Ambitious men have chance for real prosperity. Our free booklet will interest and benefit you.

PLASTEX INDUSTRIES
Dept. 3, 1085 Washington Ave., New York, N. Y.

Gets $267.00 from HER CELLAR

Mrs. M. M. of Dallas, Texas, needing extra money earned $267 within three weeks raising giant mushrooms and selling her crop to the United Mushroom Company, 3848 Lincoln Avenue, Dept. 473, Chicago, Ill. Exceptional, but this concern (Estab. 1908) shows people a reliable method of raising giant mushrooms in suitable cellars, sheds, barns, etc. It supplies everything necessary for you to start in this business and buys your crops. If you need extra money write them today for free particulars.

Editor's Workbench Chips

[*Continued from page* 12]

The motor scooter "SU-Z-Q" makes Morris Carlson the envy of all his friends in Pecatonia, Ill. It is fitted with a rather low ratio gear system to take care of the steep hills in town. On the back of "Suzy" are two cans, one for gas and the other for oil; these have saved Morris more than one weary hike back to a gas station! He writes:

"I have taken MI for several years and have made many of the projects described therein, including several radios, the MI 'Fly Electrocutor', the electric fence and many smaller things. All worked very well and I am very pleased with them."

A $3.00 prize to Morris for this excellent snapshot.

with anger and resentment at the petty bureaucracy that inflicts such needless expense and inconvenience on visitors.

Of course, whether the War Department will pay that $20.00 bill is another matter. Personally, I doubt if it will. And I wouldn't be surprised if the whole fee system is quietly killed in a little while. New York's mayor, for whom the field is named, is a pretty smart politician, and he can't ignore the obvious feeling in Washington that the big city is pulling a fast one.

***

Survey Surprises

Prospective advertisers are always asking us, "What kind of people buy MI? How old are they, how much money do they have, what are their interests, what do they own in the way of shop equipment?"

We've always had a fairly good general impression of our readers, obtained from the steady mail that pours in from all parts of the world. However, we recently decided to undertake a syste-

[*Continued on page* 16]

$5,000 WORTH OF BOAT PLANS FOR 50c!

COMPLETE PLANS AND INSTRUCTIONS FOR BUILDING 20 TESTED BOATS
Including: Plywood Auxiliary Sloop • Hunting Skiffs • Speed Boat
Utility Outboard • Day Sailers • 30-Ft. Seagoing Ketch • Motor Dory
Rowboats • Sailing Surfboard • "Kynoe" • 36-Inch Model Racing Sloop
PLUS ARTICLES OF VALUE AND INTEREST TO BOAT OWNERS

If a boat lover were to go to naval architects and buy separately the plans in the new HOW TO BUILD 20 BOATS, they would cost not less than $5,000 for the complete set.

Yet the new 1940 edition of this outstanding book gives you those same plans for only 50 cents!

Here, truly, is a bargain that no boat lover can afford to miss. Fifth in the famous Fawcett series of boat books, this handsome 50-cent volume is the best, most complete and most useful ever published.

Every plan in the 1940 HOW TO BUILD 20 BOATS has been supervised by a naval architect, assuring you of absolute accuracy. The boats themselves have all been built and tested. Every plan is simple and easy to follow.

Anyone who works with tools will find in this book a plan from which he can construct a sea-worthy craft at a fraction of the normal cost.

Here is a partial list of contents:

BARBARA Q—14 ft. utility outboard. Fairly fast with a low power motor, safe and sturdy. The ideal family boat. Seats six.

PLOVER—15 ft. auxiliary day sailing knockabout. Round bottom; carries an air-cooled inboard engine.

JITTERBUG—17 ft. V-bottom cabin sloop. One of the best boats of its kind ever offered to the amateur builder. Can be powered with an outboard motor if desired.

PIRATE TOO—17½ ft. flattie cruiser designed along the lines of a chapie. Very simple construction. Sails and air-cooled inboard auxiliary.

SEA ROVER—24 ft. round bottom cabin sloop. A real deep water boat, with fast lines and fin keel.

MIDGE—7½ ft. plywood pram dinghy.

And many others.

In addition, the 1940 HOW TO BUILD 20 BOATS features valuable articles of general interest to boat lovers; a home-made sextant for the beginner in navigation; a thrilling article on a voyage to Tahiti made in "Tahiti," built from Fawcett boat book plans, and many others.

Now is the time to get your copy of this excellent boat book. Fill out the coupon and mail it today!

CUT OUT AND MAIL TODAY!

Fawcett Publications, Inc. **MI-5**
Greenwich, Conn.

Please send me, post paid, a copy of the 1940 HOW TO BUILD 20 BOATS. Enclosed find 50 cents in check, money order or stamps. (No coins.)

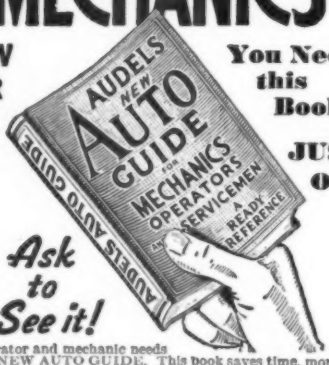
NAME .....

ADDRESS .....

CITY ..... STATE .....

MECHANICS

KNOW YOUR CAR



You Need this Book

JUST OUT!

Ask to See it!

Every operator and mechanic needs AUDELS NEW AUTO GUIDE. This book saves time, money and worry. Highly endorsed. It presents the whole subject of auto mechanics: 1—Basic principles, 2—Construction, 3—Operation, 4—Service, 5—Repair. Easily understood. Over 1500 pages—1540 illustrations showing inside views of modern cars, trucks and buses with instructions for all service jobs. Diesel Engines fully treated, fully illustrated. **To Get This Assistance for Yourself Simply Fill in and Mail Coupon Today.**

$4 COMPLETE • PAY ONLY $1. A MONTH ←

THEO. AUDEL & CO., 49 WEST 23rd STREET, NEW YORK

Please send me postpaid AUDELS NEW AUTOMOBILE GUIDE ($4) for free examination. If I decide to keep it, I will send you $1 within 7 days; then remit $1 monthly until purchase price of $4 is paid. Otherwise, I will return it to you promptly.

Name _____

Address _____

Occupation _____

Reference _____ M. M.

LEARN WATCH REPAIRING

AT HOME You can learn by our modern and original system of instruction every part of the **Watch Repairing Trade** at home. You can earn money while learning and prepare yourself for a well paying position or start in business after completing our course of instruction. Good watch repairers are in demand and generally earn very good salaries. For particulars apply to the

WISCONSIN SCHOOL OF WATCH REPAIRING
524 E. Mason St., Dept. C, Milwaukee, Wis.

FREE! CATALOG OF 1900 NOVELTIES

Mammoth catalog of **1900 unusual novelties.** Printed in two colors. Just off the press—many new 1940 and 1941 novelties, more fascinating than a World's Fair! **Radios,** candid cameras, optical goods, novelty jewelry, unusual books and seeds, airplane and hobby kits, live animals, rifles and guns, fireworks, make-up supplies, joke goods, magic, outdoor and sport items, labor-saving devices, musical instruments, puzzles, wigs, auto and bike accessories, stamps, watches, knives, rubber stamps, smoker's novelties, archery sets, field glasses, skeleton keys, banks and vaults, novelty clocks, cigarette cases, games of chance, fortune tellers, over 300 6¢ books, late inventions, fishing supplies, projectors, office time savers, muscle developers, read the back cards.

JOHNSON SMITH & CO., Dept. 523-D, Detroit, Mich.

Midget radio fits your pocket or purse. Weighs only 4 ozs. Smaller than cigarette package! Receives stations with clear natural tone. **NO CRYSTALS** to adjust—**NO UPKEEP**—only one moving part. **"TUBELESS, BATTERYLESS!" ENTIRELY NEW PATENTED DESIGN.** Has enclosed geared luminous dial for perfect tuning. Many owners report amazing reception and distance. **ONE YEAR GUARANTEE!** Sent complete ready to listen with instructions and Tinyphone for use in homes, offices, hotels, boats, in bed, etc. **TAKES ONLY A SECOND TO CONNECT—NO ELECTRICITY NEEDED!**

SEND NO MONEY! Pay postman only $2.99 plus postage on arrival or send $2.99 (Check, M.O., Cash) and yours will be sent complete postpaid. A most unusual value. ORDER NOW!

MIDGET RADIO CO., Dept. M-9, Kearney, Nebr.

Editor's Workbench Chips

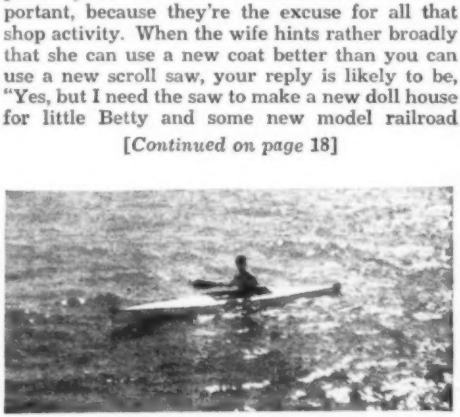
[*Continued from page* 14]

Grant Lundin, of Rathdrum, Idaho, calls this a "three horsepower" tractor because it does the work of three good horses. That's a more sensible rating than most of the "horsepower" figures claimed for various automobiles. The machine is constructed of parts from many cars. It has a Chevrolet truck rear end, an International transmission and a Model T Ford engine. What, no radio to while away the hours? The $3.00 "Workbench" check for this contribution may help buy one yet.

matic survey by means of questionnaires inserted in several thousand newsstand copies of the magazine. The general experience of the publishing business indicates that a return of 3% is normal and 5% very good, particularly if the questionnaire is a long one. Well, the MI folder was a small book, but that didn't prevent loyal and enthusiastic readers from swamping us with the record-making return of 14%! Thanks a million for the splendid cooperation, folks!

In case *you,* our representative reader, don't already know it, you are 27 years old and the owner of an automobile, a camera, a boat, a home workshop, and—I nearly forgot—a wife and probably two children. The children are important, because they're the excuse for all that shop activity. When the wife hints rather broadly that she can use a new coat better than you can use a new scroll saw, your reply is likely to be, "Yes, but I need the saw to make a new doll house for little Betty and some new model railroad

[*Continued on page* 18]



Herb Keyser, of Oakland, Cal., rides in solitary comfort in the compact kayak he built from plans appearing in the No. 4 edition of HOW TO BUILD 20 BOATS. He will receive a $3.00 prize for this sparkling snapshot.

Will you swap a few months of your time for $10,000?

Picture yourself as this ambitious young man, dissatisfied with your present status, determined to climb to a better position in life. Figure the wages you have earned during the past year. With the assistance of National Schools you should earn at least $500.00 per year more, as a man properly trained in Radio, Diesels, Electricity or Air-Conditioning. These are the big-pay trades that demand trained men. With Nationals' training, many graduates have quadrupled their pay; some even more. But conservatively, $500.00 more per year is $10,000.00 in 20 years—certainly a generous return for several hours invested per week for a few months. Training by the practical test-proven National Schools' method gives you a sense of security all through your life. You KNOW you can "deliver the goods" as a National School's graduate. This is the oldest Trade Institution in the West, with the most modern equipment—the million-dollar training headquarters, geared to your needs.

KEEP YOUR PRESENT JOB—IF NECESSARY

Here's good news. No matter where you are or what you are doing, National Schools has a training plan to fit your immediate needs. You can earn while learning. You can train while you work or enroll as a residential student at the School. National's Training Plan is *different*. It's flexible to meet your needs and your finances. Thousands have turned from failure to success by National's sensible, practical plan. Get the full details now—without obligation. Free Literature. Send the Coupon.

Train for Lifetime Success.

BECOME AN EXPERT
IN ONE OF THESE TRADES:

RADIO—TELEVISION
DIESELS—AUTOS
ELECTRICITY
AIR-CONDITIONING

No matter where you live in U. S. you can obtain National's Training at same cost as local students. Transportation allowed to Los Angeles. You can earn room and board while learning. Free Literature tells how you can train while you work at your present job and receive graduate training later—or enroll now at the School.

NATIONAL SCHOOLS

Los Angeles, California (Established 1905)

TOP PAY FOR TRAINED MEN

Choose THE JOB YOU WANT

Check Training Interested in:

- ☐ Air Conditioning
- ☐ Refrigeration
- ☐ Automotive Servicing
- ☐ Diesel Engines
- ☐ Electricity
- ☐ Machine Shop
- ☐ Radio
- ☐ Television

MAIL THIS COUPON TODAY

NATIONAL SCHOOLS, Dept. MM-5
4000 So. Figueroa St., Los Angeles, Calif.

Mail full details about Courses checked.
I (am) (am not) employed.

*Name*_____ *Age*_____

*Address*_____

*City*_____ *State*_____

by learning **DRAFTING** and **INDUSTRIAL DESIGNING**

If you want to earn more money and advance to a better job—equip yourself *now* by learning DRAFTING and Industrial Designing. You can get practical training quickly in your spare time at home—under the personal supervision of an Engineer and Industrial Designer. Drawing tools and table furnished without extra cost. Learn to draw and design new products, or to improve, re-style, streamline and modernize old products for more "eye appeal" and selling power.

Drafting is a very big field, but drawing with industrial designing is twice as big. Factories must continuously bring out new models, new products, and improved designs. You can be trained for better pay in your home as I have trained many hundred successful students. I'll train you thoroughly by applied instruction on actual work. Send coupon for full facts on "Drafting and Industrial Designing."

ENGINEER DOBE, Div. 4745, LIBERTYVILLE, ILLINOIS

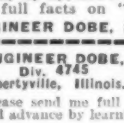
ENGINEER DOBE,
Div. 4745
Libertyville, Illinois. **Send for full Facts**

Please send me full facts on how I can train to earn more and advance by learning "Drafting and Industrial Designing."

Name ..... Age.....

Address .....

Town ..... State.....



Learn Profitable Profession in 90 days at Home

Earnings of Men and Women in the fascinating profession of Swedish Massage run as high as $40 to $70 per week but many prefer to open their own offices. Large incomes from Doctors, hospitals, sanitariums and private patients come to those who qualify through our training. Reducing alone offers rich rewards for specialists. Write for Anatomy Charts, and booklet —They're FREE.

THE College of Swedish Massage
30 E. Adams St., Dept. 558, Chicago
(Successor to National College of Massage)

GOOD PHOTOGRAPHY NO. 3

Here's a 144-page book full of worthwhile information for the person who wants to take better pictures. Contains articles by recognized authorities on the art of achieving beautiful and striking photographs. Printed in rotogravure and beautifully illustrated with salon prints, this book is something that no camera fan can afford to miss. 50 cents at your local newsstand, or postpaid from

FAWCETT PUBLICATIONS, Inc.
Fawcett Building Greenwich, Conn.

AUTOMOBILE RACING BOOKS

Tell you how to lay out and build high-speed engines, racing car frames and bodies. Complete, easily understood working drawings and building instructions. World's speed records. Complete details and illustrations world's fastest cars. Fourth Edition book deals largely with midgets. Fifth Edition covers dirt track racers and engine rebuilding. (Each book entirely different.) Order NOW—$1.00 each postpaid; $1.15 C. O. D.

RAY F. KUNS, Dept. A-17, Madisonville, Cincinnati, Ohio

ELECTRICAL CAREERS

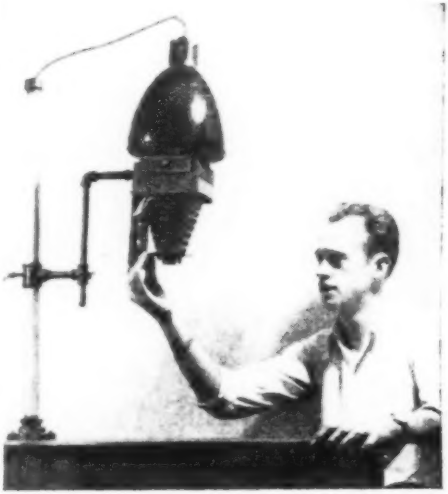
Become a Bliss technician in one year—ready to take advantage of increasing opportunities in the electrical field. Bliss men, today, fill key positions in many different electrical industries. All received the same course in fundamental theory and practice.

Modern laboratories. Successful placement. 48th year. Ask for free vocational chart. 295 Tacoma Ave., Wash., D. C

BLISS ELECTRICAL SCHOOL

Editor's Workbench Chips

[*Continued from page* 16]



This interesting photo enlarger, built by Eugene L. Van Scoder, of Waterville, Ohio, combines the best features of several different enlargers described in various past issues of MI and PHOTOGRAPHY HANDBOOK, and wins a $3.00 "Workbench" prize. The body was turned out on a wood lathe, with a recess for a pair of 3½-inch condensers. The lamp housing is an old Ford head light. The bellows is from an old 116 Autographic Kodak. The lens is from an ancient Century view camera. The negative carrier was cut down from a small printing frame and the standard is made of 1¼-inch pipe and fittings.

"Now I have an enlarger that I am proud of," writes Eugene. "I've turned out some pretty good portraits of my friends and family."

props for little Billy and that will save us a lot of money that otherwise would go for store toys."

Your cellar, garage or barn shop is a pretty attractive place. Before the final returns of the survey were in, the MI editors did a little guessing among themselves as to the relative popularity of the various machine tools.

"Bet you the lathe leads the list," said Roland Cueva.

"Maybe, but I doubt it," I said. "My money is on the circular saw, because it's such a time and muscle saver."

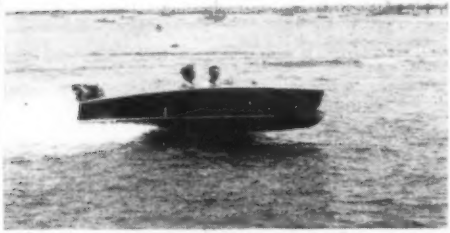
"What about the drill press?" asked George Daniels. "No matter what your project is, you have to make lots of holes in wood, metal and plastics."

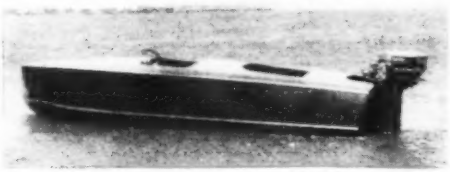
Roland was right. In the breakdown of power tools, the order was: lathe, drill press, circular saw, grinder, scroll saw. And the average shop has 2½ such tools! It was practically impossible to classify hand tools, because everybody has at least half a dozen screwdrivers, three or four saws, and hammers, wrenches, chisels, pliers, etc., no end.

[*Continued on page* 20]

Editor's Workbench Chips

Here are some more examples of readers' handicraft. Why not send in pictures of *your* projects?





You're wrong! This is not a professionally-built boat, but the famous "Buzzer" described in the No. 4 edition of HOW TO BUILD 20 BOATS. This beautiful piece of craftsmanship is the "Workbench" contribution of Elbert Witt, of Los Angeles, Cal., who certainly rates a $3.00 award. Frames, keel and knees are of oak; planking and decking are Philippine mahogony, all hardware brass. The total cost of the hull was $150, and this included pretty fancy red leather upholstery. She performs splendidly with a 32 h.p. outboard, according to its builder, and attains a speed of 35 m.p.h. Notice in the picture above how cleanly "Buzzer" skims across the water.

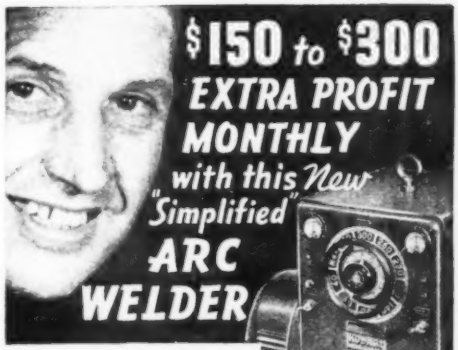
"Buzzer" is a 14-foot job. A complete set of blueprints showing its construction is obtainable from MI for $1.50, postpaid.

***

"A friend of mine gave me the August and September 1938 issues of MI and when I saw the plans for the XP-3 model plane I knew I would have to build it. Now that it is completed I am quite proud of it. The ship is finished in silver, with a red nose. It took approximately 700 hours to build. I found the plans complete in every detail and the instructions simple and to the point."

For his clear picture and excellent letter, Edward A. Rich, of Omaha, Neb., rates a $3.00 prize. With its 10-foot wingspread, the XP-3 is a rather complicated model, and requires considerable skill on the part of the builder.

By the way, the August and September 1938 issues of MI are no longer available, but the XP-3 articles were republished in the MODEL BUILDER'S HANDBOOK, and complete blueprints are obtainable for $1.50.



IT'S EASY TO GET BIG PROFITS WITH HOBART ARC WELDING EQUIPMENT

Because of big profits realized with the Hobart 40-Volt "Simplified" Arc Welder you can start a big paying business of your own . . . with almost no investment! Arc welder prices are the lowest in history, making it possible for even the smallest shop to own one of these money-makers. Extra profit from a single job is often more than enough to take care of the small monthly payments. Arc welding is today's profit opportunity . . . don't miss it!

Remote Control. This is an important feature you get at no extra cost with Hobart. It lets you control your welder from any working point. Saves time, temper and eliminates the need for a helper on overhead or concealed work.

Easy to Operate. Hobart Welders have "Simplified" operation. This means faster welding—with the right current for every job. Hobart is so simplified that any one of your men can weld easily and successfully. The mystery and uncertainty of obtaining correct welding current settings are removed.

60% Extra Capacity over old style 25-Volt Welders . . . necessary for welding with the new coated rods. Automatic reactance lets you handle light welder work without losing the arc. Users don't understand how they got along with old style welders after trying this new Hobart.

"Pays-for-Itself" Terms. You can try this complete Hobart Welder in your own shop for 30 Days Trial to prove that extra earnings and savings obtainable with this improved welder makes it easy for you to own a Hobart with practically no cash outlay.

HOBART BROS. CO., Box SM-540, Troy, O.
One of the World's Largest Builders of Arc Welders.

PAYS FOR ITSELF WITHOUT EXPENSE TO YOU...
30 DAYS TRIAL
TO PROVE IT

SENSATIONAL NEW A.C. ARC WELDER

Handles repair and construction jobs—easy to operate; unusually low current cost. Equipped, ready to weld—only $12.50 Per Month

BUILD YOUR OWN
Simplified **ARC WELDER**

It's easy and profitable to build your own portable electric arc welder with the aid of this complete Hobart Generator. Simply attach to old motor and mount on chassis and you have the factory equivalent and equipment costing from $300 to $500 more! This equipment lets you operate anyplace, especially on the profitable outside jobs. Check coupon for detailed information.

FREE!
THIS VALUABLE BOOK ON ARC WELDING

HOBART BROS. CO., Box SM-540, Troy, Ohio

Tell me more about—

( ) Building My Own Portable Welder
( ) Complete Gas Engine Drive
( ) New Hobart A. C. Welder
( ) Electric Drive Welder
( ), Send FREE Book On Arc Welding
( ) 30 Days Trial and Easy Terms

NAME _____

ADDRESS _____

CITY _____ STATE _____

Get the THRILL of building it yourself

Get the THRILL of building it yourself! There's a lot of he-man thrill in a short-wave radio of your own. But the biggest thrill is putting this magic Voice-of-the-World together YOURSELF. Our new FREE radio catalog No. 80 features a wide selection of Build-it-Yourself kits and items designed to make that thrill come true. But that's not all. This big 120 page book also contains thousands of other items — tubes, accessories — everything you need in radio. And at real money-saving prices. Don't miss it!

WORLD'S FINEST RADIO CATALOG FREE!

Why wait? Begin now to save on everything you need in radio. This catalog points the way. Mail the coupon for your FREE copy.

LAFAYETTE RADIO

NEW YORK, N. Y. 100 SIXTH AVENUE
CHICAGO, ILL. 901 W. JACKSON BLVD.
ATLANTA, GA. 265 PEACHTREE STREET
BOSTON, MASS.
BRONX, N. Y.
NEWARK, N. J.
JAMAICA, L. I.

Radio Wire Television Inc.
Dept. 22E —100 Sixth Ave., New York.
Rush **FREE** 1940 Radio Catalog.

Name.....
PLEASE PRINT
Address.....
City.....State.....

PASTE COUPON ON PENNY POSTCARD

RADIOS..SAVE UP TO 50%

DEAL DIRECT . . . FACTORY PRICES . . . Over 50 models to choose from at wholesale. AC-DC midgets $4.98 up. Portables $9.98 up. Farm sets $9.98 up. Car sets $9.98 up. Consolettes $12.98 up. Samples at 50% off. Quantity discounts. FREE 1940 bargain catalog giving details of 10 day FREE trial, agent's proposition, discounts. No obligation, write today.

10 DAY TRIAL — $4.95 EACH in lots of 3 — Free Catalog — R.C.A.

GOLDENTONE RADIO CO.
DEPT. MI DEARBORN MICH.

PLAY THE REAL HAWAIIAN WAY

HAWAIIAN GUITAR—Learn right in your own home. EASY, SHORT-CUT METHOD. No tiresome practicing, all melody. LEARN TO PLAY BY PLAYING. Win friends and popularity. Get "on the air". Make money. Hundreds of our students now successful in orchestras, radio and teaching. You can do the same. FREE ILLUSTRATED BOOKLET "Learn to Play the Hawaiian Way" tells all about this easy, fascinating way. Write today.

OAHU SCHOOL OF MUSIC
1305 Film Bldg., Cleveland, Ohio.

NEURITIS

Relieve Pain in Few Minutes *or Money Back*

To relieve the torturing pain of Neuritis, Rheumatism, Neuralgia or Lumbago in a few minutes, get NURITO, the fine formula, used by thousands. No opiates. Does the work quickly—must relieve cruel pain to your satisfaction in a few minutes—or your money back. Don't suffer. Clip this ad now as a reminder to ask your druggist for NURITO today.

Editor's Workbench Chips

[*Continued from page* 18]

This trim little auto trailer is the handiwork of Ralph Mayhugh, of Jefferson, Iowa. It is eight feet long, four feet wide and four feet high, holds a full size mattress for two people, has a two-burner gasoline stove, and weighs 600 pounds. It is built mainly of ordinary plywood.

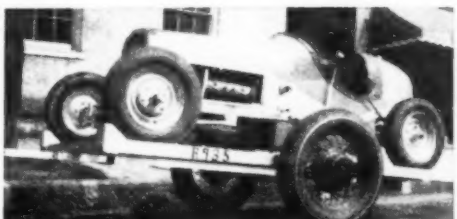
"This trailer will go anywhere a Model T Ford will go," boasts Ralph. "I have pulled it 3000 miles, 300 of them in the Ozark Mountains, where the going isn't exactly smooth. Some people call it a 'doghouse', but it's really a comfortable travelling home for two. And the best part of it is that it cost me only about $20!"

The $3.00 check that Ralph will receive for his contribution will cut the cost to $17, which is pretty cheap for such a fine little job.

Going On the Air

I am constantly annoyed by references in the movies and the newspapers to "amateur short-wave broadcasters." As the farmer said when he saw a giraffe for the first time "There ain't no sech animal." Amateur radio stations can engage only in communication with each other, and are specifically prohibited from transmitting music or any form of "entertainment." Actually, comparatively few amateurs use radio telephony ("voice"), although they're the ones who get the most attention from owners of all-wave receivers. Most "hams" operate on radio telegraphy ("code") because a low-powered telegraph outfit carries much further than a phone rig of the same rating.

[*Continued on page* 21]



"I built this midget racer partly from various photos that have appeared in the 'Workbench,'" writes Ken Gallup, of 55 Main Street, Cooperstown, N. Y. "It has a 75" wheelbase, 45" tread, and is powered by a Ford V-8, 60 h.p. engine. The front axle is from a Model T Ford, the rear axle from a Model A. This car has been paced at better than 80 m.p.h.! The trailer shown is also of my own design."

A neat little car, Ken. The $3.00 check that is going out to you will buy some gas for it.

Editor's Workbench Chips

[*Continued from page* 20]

Many people who would like to "go on the air" have an idea that transmitting apparatus is very complicated and expensive. Not at all! A good transmitter is much simpler than most receivers and costs only a fraction as much. If you want to be convinced, turn to page 90 of this issue and observe that the "Mighty Mite" is about the size of two ordinary cigar boxes and uses only two tubes.

***

FM

While we're still talking radio, I'd like to call your particular attention to the article on frequency-modulation, also in this issue. The word "revolutionary" has been much overworked, but it certainly can be applied in its fullest sense to this extraordinary development by Edwin H. Armstrong. Static and interference have been the twin bugaboos of radio since the earliest experiments of Marconi, and here at last is a new *system*—not merely a gadget or attachment—that eliminates the trouble in one sweep. Imagine listening to a flawless program, uninterrupted by the slightest noise, while lightning flashes overhead during a violent electrical storm! This is a common accomplishment of FM, as the system is now popularly called. The aircraft services, which need radio most when the weather is worst, will especially benefit from FM.

[*Continued on page* 22]

"I am an ardent reader of MI but never tried building anything until I saw the plans for the 'Spitfire' model racer in the July 1939 issue," writes A. C. Ratliff, of St. Augustine, Fla. "Here is a snapshot of the finished product, and I am very proud of it. It has a speed of 52 m.p.h."

That's fast going, even for the "Spitfire." The $3.00 award that is being sent to Mr. Ratliff will buy him enough gas to run the model across the country.

The complete article describing "Spitfire" was reprinted from MI in the 144-page MODEL BUILDER'S HANDBOOK, copies of which cost only 50 cents at any newsstand. Full-size blueprints of the car are available for $2.00, postpaid.

Big League Baseball players are trained men—they are there because of TRAINING plus experience. It is the same in the rapidly growing Diesel industry—those "on top," didn't just happen. They were trained—by long experience—or by intensive schooling. Hemphill Diesel training is a short-cut to practical experience. Find out about it.

Today's giant Diesels, in industry, buses, trains, boats and trucks, are masterpieces of engineering development. They require skilled and trained men to service, adjust, repair and maintain them. Before you can "know how," you must "learn how." Find out about Hemphill training. You can start to learn at home—take shop work later. Day or night shop courses also. Investigate, mail coupon today. No obligation. Get your free copy of "March of Diesel."

HEMPHILL DIESEL SCHOOLS

All communications concerning enrollment in any of the Hemphill Diesel Courses should be sent to one of the following addresses:

NEW YORK . . . . . 31-29 Queens Blvd., L. I. C.
CHICAGO . . . . . 2013 Larrabee Street
MEMPHIS . . . . . 423 Monroe Avenue
LOS ANGELES . . . . 2018 San Fernando Rd.
VANCOUVER, B. C. . . . . 1361 Granville St.

HEMPHILL DIESEL SCHOOLS (use nearest address)
★ Please send data on your Diesel courses, also free copy of illustrated booklet "March of Diesel."

Name_____ Age_____
Street_____
City_____ State_____ m-46-m

Diesel courses in both English and Spanish for students in U.S. and Latin America. Write for information and terms.

ELECTRICAL BOOKS shipped FREE

10 BIG BOOKS

MODERN ELECTRICITY INCLUDING RADIO AND TELEVISION

Here's great news for anybody interested in Electricity. BRAND NEW 17th. edition of Applied Electricity brought right down to date with NEW Electrical subjects fully covered. 10 big Volumes and all shipped **FREE** for examination.

For Beginners and Experts

Over 3000 pages—hundreds of illustrations—the most complete work of its kind we have ever published. Dynamos, motors, power stations, radios, television, everything electrical explained so anyone can understand it.

BIG FIELD! Big Demand! Big Pay! Men who understand electricity are urgently needed in thousands of industries. Autos, airplanes, machine shops—practically every industry depends on electricity and men who know this subject make big money. Pleasant, fascinating work, easy to learn and do; learn with these books. Send coupon for a set for **FREE** examination and see for yourself.

SEND NOW A year's consulting membership in the American Technical Society now given to all buyers of this famous Cyclopedia of Electricity.

AMERICAN TECHNICAL SOCIETY (Publishers—Home Study Courses)

American Technical Society, Dept. E-5320, Drexel at 58th St., Chicago
Send for 10 days' free use, BRAND NEW 10 volume set of Applied Electricity. Because I send NOW you agree to send me a certificate of membership in the American Technical Society entitling me to full consulting privileges for one year. I will pay the few cents delivery charges on the books. If I wish I may return them in 10 days and owe you nothing, but if I keep them, I will send $2.00 after 10 days, then $3.00 a month until the total price of only $29.80 is paid.

NAME _____

ADDRESS _____

CITY _____ STATE _____

Please attach letter stating age, occupation and name and address of employer and give at least one business man as reference.

LEARN TO DANCE $1.50

At Home, This New Easy Way

Lead and follow correctly, learn the Modern Fox-Trot, Dreamy Waltz, Tango, Society steps. Learn all the Old favorites Round-Square dances, latest Barn Dances. Don't be a Wallflower. Easy as A.B.C. No music or partner required. Make your dancing Magnetic, Fascinating, Alluring, Glamorous, Professional. Even a child can learn. Send No Money—Pay Postman $1.50 plus a few cents postage. Or send $1.50 and we pay postage.

DANCE STUDIOS, Dept. R, P. O. Box 674, McAdoo, Pa

NEW WAY TO

CHOOSE A CAREER

LET SCIENCE PICK A JOB FOR YOU!

TODAY, getting a job or choosing a career is no longer a hit-or-miss task. Science can now accurately determine for you, in advance, just what type of work or profession you are best suited for.

FREE Send your name on a penny postcard for FREE booklet explaining this new proven way to greater success.

Vocational Guidance Associates, Dept. 35, Greenway Station, TUCSON, ARIZONA

MAKE MONEY AT HOME

RUBBER MOLDS Low as 6¢ EA.

Amazing rubber mold-making outfit makes perfect flexible molds or plaques, ash trays, book-ends, etc. Molds cost from 6c to 25c each. Each mold makes hundreds of novelties and gifts to sell up to $1.00 apiece! No experience necessary. Quick and easy. Start profitable business in your home . . . sell to stores, gift shops, friends, resorts, road stands, by mail. Full or spare time. "Molders Handy Book," and list of buyers FREE. Write **SO-LO WORKS, Dept. G-834, Cincinnati, Ohio.**

Editor's Workbench Chips

[*Continued from page 21*]

What's a picture of a house doing in the "Workbench"? Well, it really does belong here, because this is the "shop" project of Louis Heyman, of Milwaukee, Wis. Let his letter explain:

"I am building my own home. A couple of years ago your magazine ran some plans and ideas for construction, so I set to work. This picture shows the results so far. Actual labor cost to date has been $25 for a mason, so I could get the basement in during a vacation week. All other work is being done by myself, with aid of faithful wife and a willing hand from a friend or relative. We have a plan called the '5 year pay as you go'. Thanks for the inspiration!"

For the mere novelty of his contribution Mr. Heyman deserves a $3.00 "Workbench" award. Lots of luck and send us a picture of the house after it's finished.

Armstrong is probably the least publicized inventor of recent times. He won't even allow pictures to be taken of himself in his laboratory and he releases for publication only the rather formal portrait that appears on page 44. When this article was being prepared for MI, I pleaded with him over the phone for fifteen minutes to let me take just one lab shot, but nothing doing! Don't get the idea that he is a stuffed shirt! When the tower for his experimental station at Alpine, N. J., was being erected, he joined the riggers in one of those tiny "bos'n" seats and helped swing the antenna wires 400 feet in the air over the Palisades!

***

Next Month

With warm weather here, lot's of us are again thinking of boats and boating. I am glad to announce that the forthcoming June issue of MI will feature plans for an excellent 15-foot canoe of unusually simple and rugged construction. It has no bent ribs, which are the cause of so many headaches to boat builders, but instead uses plywood molds. For lake and river service this will prove an ideal craft. Of course, complete blueprints for it will be available.

For model builders we will have plans for the "Little Queen," a gas-powered plane with a raised taper-type wing. This is something like 8½ feet

[*Continued on page 23*]

Editor's Workbench Chips

[*Continued from page* 22]

wide overall and therefore isn't so "little." It's a beautiful job and will attract a lot of attention wherever it is flown.

***

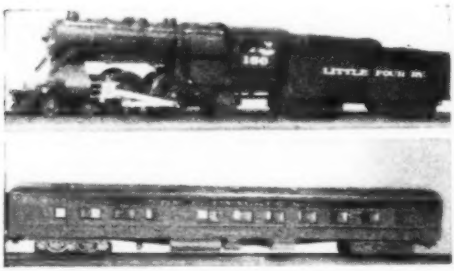
About Pictures

I receive from readers many poor pictures of fine projects, which I am forced to return because the engraver just can't make respectable engraving of 'em. I'd like to offer a few suggestions to would-be contributors.

Always try to pose a person in the picture, to give an idea of the size of the project. Don't be modest; get into the scene yourself, and have a friend or some other member of the family click the shutter. Don't try for fancy effects. Pick a blank wall of neutral color for the background; nothing is more confusing in a picture than a mess of tools, curtains, trees, etc., just behind the main center of interest. You don't need an expensive camera. Any small Kodak will turn out a good picture. The real trick is to use a tripod or any other means of steady support. Indoors, use a photoflash bulb. Just read the instructions on the box, and you can't go wrong. Outdoors, try to keep out of the sun. Yes, I said *out of* the the sun. Direct sunlight makes pictures extremely contrasty and forces human subjects to squint. Pick a day when the sky is clear, pose your stuff on the shady side of the house and snap away. You'll find that the diffused light from the sky will make what I call a "smooth" picture.

Don't send us negatives. Hold onto these. Just send us clean, glossy prints. We don't care how small or big they are, as long as they are distinct.

[*Continued on page* 24]



Don't these look lifelike? They're only models, of course, but they are so well made they'd fool the unwary. And they represent the first attempt at model railroading by Irving L. Johnson, of South Haven, Mich., who followed the plans for "Midget Mike" published several years ago in MI. The little engine does about 90 m.p.h. (to scale!), pulling a train of five cars. A $3.00 "Workbench" award to Mr. Johnson for his well-taken pictures.

Incidentally, we'd like to see more pictures of home-made model railroad systems. What say, readers?

HOW TO DO AUTO REPAIRING By FACTORY Methods

Based on Official FACTORY Books Covering ALL Cars 1934-1940 Inclusive

Regardless of the car you want to repair, MoToR's new Shop Manual will show you the *factory-correct* way to do the job! Gives official manufacturers' data needed by every mechanic for overhauling or adjusting every American automobile made since 1933. Used daily by thousands of repair shops, students and men who like to "fix their own."

494 BIG 8¼ x 11 PAGES — 900 PHOTOS, DRAWINGS, CHARTS, TABLES — Give Nearly 200,000 Vital Facts On:

Engine overhaul — Electric system — Fuel system — Cooling system — Clutch — Transmission — Universals — Rear End — Wheels — Brakes — Front End — Shock absorbers — Steering — Ignition timing — Lubrication — Valve adjustments — Engine specifications and clearances — Generators — Starting motors — Starter controls — Carburetor adjustment — Automatic chokes — Gasoline gauges — Oil filters — Cylinder head tightening — Generator controls — Clutch boosters — Headlamp adjustment — Brake boosters — Wheel alignment — and hundreds of other detailed subjects.

PRICE ONLY $3 Your Money Back if not Satisfied

ORDER C.O.D. NOW!

MoToR, Book Department, 25 East 56 St., New York

Please rush me copy of MoToR's 1940 Factory Shop Manual. I will pay postman $3 plus a few cents delivery charge, but it is understood that if book does not satisfy me I may return it within 7 days (and in its original condition) and have the $3 purchase price refunded immediately.

NAME_____

ADDRESS_____

CITY_____ MX-1

LAW STUDY AT HOME

Legally trained men win higher positions and bigger success in business and public life. Greater opportunities now than ever before. Big corporations are headed by men with legal training.

More Ability: More Prestige: More Money

We guide you step by step. You can train at home during spare time. Degree of LL. B. Successful graduates in every section of the U.S. We furnish all text material, including 14-volume Law Library. Low cost, easy terms. Get our valuable 48-page "Law Training for Leadership" and "Evidence" books FREE. Send for them NOW.

LaSalle Extension University, Dept. 5493-L, Chicago
A Correspondence Institution

REAL JOBS OPEN!

FOR TRAINED AUTO MECHANICS

Learn QUICK! In As Little As 8 WEEKS REAL SHOP TRAINING

AUTO, DIESEL and AVIATION Mechanics, welding, body & fender taught with real tools, on real equipment, in 2 biggest, best schools of their kind in the world. Step into Big Pay—$35-$60 a week. Low tuition cost! Pay for part of course later! FREE BOOK! Send for Big, Free Opportunity book and new low rate—write nearest school TODAY!

McSWEENY SCHOOLS Dept. J-5 Detroit, Mich. Kansas City, Mo.

LEARN to PLAY BY EAR

Here is a wonderful NEW way to learn to play the piano, without notes, in as little as 90 DAYS. Play anything—swing to classical.

NEW SYSTEM is easy. You don't have to practice scales, you don't have to study for years. Young or old have equal opportunities. Amaze your friends. Play for pleasure or for money. Cost is very low, payments easy. Send for complete FREE details. No obligation.

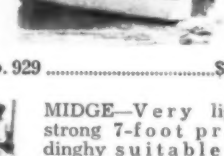
Karl Ostrum, Pres.
HARWOOD SCHOOL OF MUSIC DEPT. 55, Chicago
500 N. Dearborn St.

BUILD IT THIS SPRING!

Here are a few of the TESTED models and boats you can build from *Mechanix Illustrated* blueprints. Get an early start so you'll have your project finished when the warm weather begins.

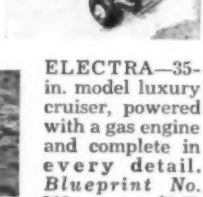
MOUNTAIN LAKE SKIFF—A sturdy, simple 12-foot skiff made of waterproof plywood. Light enough to transport easily, yet strong enough to carry a good load. *Blueprint No.* 923 .....$1.50

PIXIE—Comfortable 20-foot plywood auxiliary sloop, designed by Sam Rabl. Easy to build, and has roomy accommodations. V-bottom, with outside keel. *Blueprint No.* 928 .....$5.00

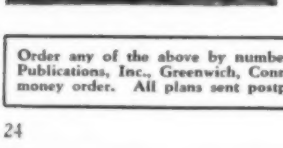


BARBARA-Q—14-foot utility outboard runabout, ideal for family use, camping or fishing trips. Takes any motor from 5 to 16 hp. *Blueprint No.* 929 .....$2.50

MIDGE—Very light, strong 7-foot pram dinghy suitable for boat tender, or may be used as sailing and rowing dinghy. *Blueprint No.* 927 .....$1.00



MI WHIRLWIND—Flashing, streamlined model racing car with midget gas engine driving an airplane propeller. This racer needs no complicated gears or flywheel, is very fast. *Blueprint No.* 318 .....$1.00

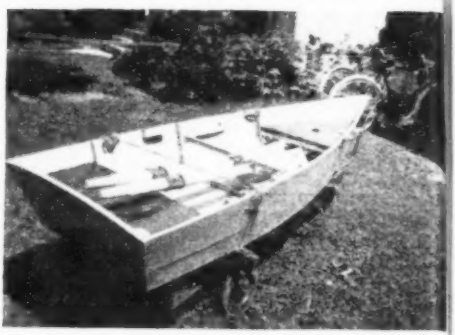


ELECTRA—35-in. model luxury cruiser, powered with a gas engine and complete in every detail. *Blueprint No.* 319 .....$1.50

Order any of the above by number, addressing Fawcett Publications, Inc., Greenwich, Conn., enclosing check or money order. All plans sent postpaid.

Editor's Workbench Chip

[*Continued from page 23*]



"This rowboat was built from plans in the book HOW TO BUILD 20 BOATS, No. 4 edition," writes George R. Forrester, of Saskatoon, Sask., Canada. "The total cost complete with sail, was about $10.00. The trailer was copied after the auto trailer in the same issue. The whole unit rolls along very nicely behind a bicycle, and my chum and I have made several trips to a lake about four miles from here. The boat will hold three people and still have a small amount of freeboard. Our chief difficulty here is to obtain the proper woods for boat building."

This is the first boat trailer we've ever seen that is hauled by a bicycle. The $3.00 check that George will receive may make him peddle more cheerfully the next time he takes the boat out!

Spin the Prop

If you are one of those "I-wish-I-could-fly" persons who hangs around air fields admiring the sight of planes in graceful flight, you'll get a lot of enjoyment out of a new book entitled "I'll Take the High Road," by Wolfgang Langwiesche (Harcourt, Brace and Company, New York, $2.50).

Flying is easy. Langwiesche says so. He proves it. He makes you feel as though you could lay his book on the table, walk out to a plane and take off. Of course, flying through the air is not like driving a car. There are a few tricks you must know, but you don't have to be a superman to master them.

Just as you learn to lean into the wind when walking, so must you learn to adjust your plane to the proper bank or glide or climb angle in relation to the ground when flying. You must also readjust your sense of perspective. And that's what Langwiesche does in this book! He gives you a new perspective on flying in light planes; tells how easily and how cheaply you can travel from one point to another; tries to convey the delicious sensation of floating through the air and gives you a bird's eye view of this and that and all but lets you handle the innocent little "stick" itself.

The book is fascinating in its simplicity and should interest the flying enthusiast as well as the prospective student. When you are through reading it, you will either say, "Well, what am I waiting for?" or else you will continue to scratch your head and sigh, "I wish I could fly."

—Robert Hertzberg, Editor.

New Thermometer Tells Temperatures At A Distance

A new kind of remote acting thermometer, that can measure the temperature of distant objects without ever going near them, has been developed by Dr. John Strong, physicist of California Institute of Technology here.

The new device is a pyrometer. This name is a misnomer, in part, for ordinary pryrometers are commonly used only for measurements of temperatures of extremely hot objects such as the molten metal of an open hearth furnace in a steel mill.

As a metal gets hotter and hotter, it turns to dull red, bright red and finally virtually white in color. An ordinary pyrometer uses this change of radiation wavelength (for that is what the different colors mean) to determine temperature.

Dr. Strong's new instrument simply applies this same trick for invisible radiation wavelengths in the very far infra-red region of the spectrum. His pyrometer is useful in the temperature range from minus 100 degrees centigrade to the temperature of boiling water, with an accuracy of 0.1 of a degree centigrade.

To measure temperatures with the new pyrometer a small telescope attached to the device is pointed into the wide-mouthed neck of a jug of melting, cracked ice. This gives a reading on the scale of the instrument corresponding to a temperature of zero degrees centigrade.

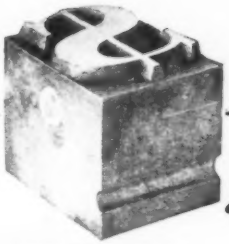
Next the telescope is pointed at an opening in an ordinary five gallon oil can containing live steam. The reading on the instrument is noted for this known temperature of 100 degrees centigrade. Finally the object, whose temperature is to be measured, is picked up in the telescope and it produces a given reading on the instrument.

Knowing the two fixed temperature point readings (melting ice and steam at 100 degrees) one needs only to look on a conversion chart at the point observed by the instrument for the given object and its temperature can be read off.

In principle the new pyrometer is an infra-red spectrometer which—by means of a grating and multiple reflections off suitable crystal surfaces—picks out the single infra-red radiation wavelength of 8.8 mu. (1,000 mu corresponds to wavelengths one millimeter long). The emission of this particular wavelength in the infra-red region by the ice, the steam and the object whose temperature is being measured, is used and correlated into a final temperature reading.

Important applications await the new instrument. It can be applied for temperature measurements on objects that are inaccessible for ordinary thermometer devices.

It can be used, too, in meteorology to make determinations of the water vapor content of the atmosphere. In astronomical and terrestrial physics new uses are being studied.



Learn

ADVERTISING from experts

• International Correspondence Schools are the world's oldest and largest home-study schools. In the past 48 years, millions of dollars have been spent advertising I. C. S. by direct mail, newspapers, magazines, movies and radio. From that wealth of experience come I. C. S. Advertising Courses. Today, graduates hold high positions in the advertising world. Learn advertising the sure way—from a successful advertiser! Mail the coupon.

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 2319-U, Scranton, Penna.

Send me—*free*—information on subject checked:

☐ ADVERTISING

☐ Accounting ☐ Mechanical Engineering
☐ Air Conditioning ☐ Radio & Television

Name.....

Address.....

AVIATION APPRENTICES

AIRMINDED YOUNG MEN INTERESTED IN TRAINING FOR ENTERING THE WELL PAID FIELD OF AVIATION AS APPRENTICES—Write immediately, enclosing stamp.

MECHANIX UNIVERSAL AVIATION SERVICE COMPANY
WAYNE COUNTY AIRPORT Box 857 Dept. A Detroit, Mich.

MECHANICS-WELDERS - COLLISION MEN

Big pay jobs for trained men in Auto and Diesel Mechanics, Electric Arc and Acetylene Welding. Complete courses. Practical training. Short courses in body and fender bumping, spray painting, metal finishing. Fine equipment. Special low rates. Pay-after-graduation-plan. Write today.

MICHIGAN TRADE SCHOOL
3763 Woodward Ave., Detroit, Mich.

Write for FREE FOLDER

MYSTERIOUS DEVICE WELDS BRAZES AND SOLDERS ANYONE CAN OPERATE

Now, an electric welding, brazing and soldering Torch, complete with power unit, goggles and supplies. **Works INSTANTLY off any light socket.** Does a thousand and one repair jobs at amazingly LOW COST on aluminum, iron, steel and other metals. **Indispensable** for Auto, Body and Fender Repairs, and home repairs—shop, factory, farm, engineer, janitor, sheet metal, radio and bicycle repairs. Anyone can handle without previous experience with our simple instructions. **10-DAY HOME TRIAL** Write at once for Special Introductory Low Price Offer. Try 3 in 1 Electric Torch for 10 days at our risk, or get one free by helping to introduce it. ELECTRO-TORCH CO., 2813-KS, Michigan Ave., Chicago

PRESTO! ANYONE CAN MASTER GLAZE
LEAVES HARD GLASS-LIKE FINISH
SEALS THE PORES OF THE SURFACE
EASY TO APPLY
PROTECTS THE SURFACE
WILL NOT FINGER-MARK
EASY TO KEEP CLEAN
NO OILY FILM AS WITH POLISH
NO SMEAR OR STREAKS AS WITH WAX
LASTS SIX MONTHS TO A YEAR
SAVES YOU MONEY

Car Owners! Meet Master Glaze—the sensationally different luster for new and used cars! Not a wax—not an oil polish—not a paint!—nothing that "smears" over the surface. **MASTER GLAZE** is a unique discovery—a creamy liquid—quick and easy to apply! Gives a hard, glass-like surface. Even gasoline cannot dull it! Lasts six months to a year! Amazing luster—beautiful, sparkling clean and brilliant! Doesn't finger-mark—doesn't smear! A match box full glazes an entire car. Seals the pores—protects! NOTHING LIKE IT!

AGENTS An unusual opportunity! Quick, flashy demonstrator. Big profits. Good territory. Write today!

FREE SAMPLE Write now for FREE BOOK-**Offer!** LET and FREE TRIAL OFFER. Just send your name and address. Write

MASTER GLAZE CO., 7720-181 W. Harwood Ave., Milwaukee, Wis.

NEW STREAMLINE BENJAMIN AIR RIFLES

BENJAMIN

HARD ACCURATE SHOOTING WITH CHAMBERED AIR

You can use new models BENJAMIN AIR RIFLE WITH LEVER HAND PUMP anywhere, for practice firing or just plinking around the house or camping, fishing, hunting, etc., at lowest cost. Shooting force is adjustable depending on AIR PRESSURE—amazing maximum power and accuracy—will penetrate to ½". Hair trigger firing without lunge or recoil. Single Shot BB $7.50. Remaster BB $9.00. Rifled Cal. .22 or .177 Single Shot $8.50. Ask your dealer all about them or write for complete specifications—targets and blueprints "FREE" if requested. We also make a complete line of BENJAMIN AIR PISTOLS for target and small game. WRITE TODAY.

BENJAMIN AIR RIFLE CO., 829 MARION ST., ST. LOUIS, MO., U.S.A.

New Catalog —of Bargains in Military, Outdoor and Sport Goods, Clothes, Shoes, Boots, Blankets, Tents, Firearms, Boy Scout Supplies, etc. Send 10¢ for copy to be redeemed on first order.

A AND N SUPPLY CO.
4813 Lester St.
Richmond, Virginia
EST. 1868

"HOW TO BUILD IT"—ALL NEW!

Packed with useful and fascinating home workshop projects, this profusely illustrated 146-page book is the finest of its kind ever to be offered to the home workshop fan. Contains articles on woodworking and metal projects, radio, power bike, hammered copper ware, lamps, glass blowing, water skis, tennis table, and dozens of other projects that will open new vistas for the home workshopper. 50 cents at your newsstand, or postpaid from

FAWCETT PUBLICATIONS, Inc.
Fawcett Building — Greenwich, Conn.

FACTORY-TO-YOU SAVES YOU UP TO 50%

EASY TERMS

PUT THIS NEW **14-TUBE** CHASSIS IN YOUR PRESENT CABINET only **$19.95** COMPLETE

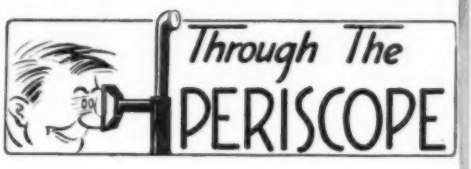
30 DAYS TRIAL

FOREIGN RECEPTION

Other models from 5 to 17 Tubes, and up to 5 Wave Bands.

● Write for FREE 1940 catalog, showing complete line. (User-agents make extra money!) See MIDWEST'S Answer to TRADE-INS!

MIDWEST RADIO CORPORATION
Dept. 10-J — Cincinnati, Ohio



A motion picture company, making a movie of prehistoric days, recently found itself stumped. It had produced with scientific accuracy a battle between a tyrannosaurus and a dimenrodon, but it didn't know what kind of sound the animals should make. For the answer to their problem, the company sought out Dr. E. H. Sellards, University of Texas geologist. The professor's guess was that one of the creatures hissed and the other bellowed.

"But I wouldn't worry too much about it," he added gently. "The two animals lived about a hundred million years apart, so I doubt very much if they could have heard each other!"

* * *

When Hamlet said: "There is something rotten in the state of Denmark," or words to that effect, he may have had a premonition of the latest agricultural note from that country. Seems the Danes have spent a lot of time developing a certain type of poppy, and at last their efforts have been greeted with success.

The result—a nice, new opium factory!

[*Continued on page 27*]

By Loucy Graff

"Why didn't you tell papa you're using stronger rubber bands in your plane now?"

Through The Periscope

[*Continued from page 26*]

By Jimmy Caborn

"Paw! Wake up and shut off the milker!"

A novel way of presenting college themes was originated at Princeton University when Frederick Ferris, a top-notch student in the geology department, turned in a 20,000-word work on "The Geology of New Jersey," transcribed on ten 12-inch records instead of in the usual typewritten booklet. The idea of recorded themes aroused praise and enthusiasm in the geology department, Professor Erling Dorf commented: "In my 12 years at Princeton I have never heard of such a procedure, but it is certainly a very original idea and Ferris is to be commended for the very fine job he has done."

You like that "Readin', recordin' and 'rithmetic," eh, Prof?

[*Continued on page 28*]

GET INTO THE BAKING BUSINESS!

..Announcement

National Baking Institute announces—a new home study Course in Modern Baking Practice and Management based upon the experience of many leading bakers and prominent plants.

A most practical "learn by doing" teaching method has been evolved and each student is under the direct supervision of experienced instructors, which helps to make progress more rapid and certain.

Baking is nearly a depression proof business and probably never before were opportunities greater than today for men with the right kind of training. National Baking Institute now makes it possible to qualify for these opportunities at home during spare time.

Tuition very reasonable. Terms easy. Common school education is sufficient. Mail coupon below today for interesting free booklet "Opportunities in the Baking Industry."

National Baking Institute
3601 Michigan Ave., Dept. 2055
Chicago, U. S. A.

MAIL COUPON NOW

National Baking Institute
3601 Michigan Ave., Dept. 2055
Chicago, U. S. A.
Send me free booklet and full particulars.

Name..... Age.....
Address .....
City..... State.....

Home Study
EARN A DEGREE AT HOME
From A Chartered Institution of Higher Learning
Employers Now Demand College Graduates With Degrees
88 Degree Courses in Art; Sciences; Philosophy; Education; Psychology; Public Health; Sociology; Physics; Chemistry; Pol. Science; Theology; Law; Business Training; Accounting; Statistics; Adv.; Sales; Agriculture, Electrical, Mechanical, Civil, Structural, Diesel; Architectural, Mining, Drafting, Automotive, Aeronautical, Radio, Refrigeration, Highway, Marine, Air Conditioning, Geology, Petroleum, Industrial, Chemical Engineering. Founded 1908. 170 p. Catalog Free.
McKinley-Roosevelt Graduate College, 4750-C Sheridan Road, Chicago

AVIATION WANTS MORE LINCOLN TRAINED MEN

Now is the time to get into Aviation! Airlines, Airports, Airplane Factories now expanding must have thousands more trained men. Exceptional opportunities now for Pilots, Mechanics, Aeronautical Engineers. 150 Lincoln Graduates recently placed in good positions with leading Aviation Companies New York to California. Opportunities for many more.

BE A COMMERCIAL PILOT. Prepare here for a fascinating flying position. Lincoln's **APPROVED** Flight Training prepares for **both** a Commercial Pilot and Flight Instructor Rating. Also, **APPROVED** Flight Training for Private Pilot Rating. Large fleet of Training Planes. **BE AN AERONAUTICAL ENGINEER.** Career training in Aeronautical Engineering prepares Graduates for responsible positions with Airplane Builders and Airlines. Only two years required. Training emphasizes Airplane Design and Construction. Engineers earn big pay! **BE AN AIRLINE MECHANIC.** Learn Airplane and Engine maintenance, overhaul, repair. Lincoln's **APPROVED** Mechanics Training prepares for position as Gov't. Rated Airplane and Engine Mechanic with Airline or Airport. Other Mechanics Courses prepare for immediate employment with Airplane Factories. **START TRAINING NOW AT LINCOLN.** Prepare here for one of these good positions. **MAIL COUPON TODAY for complete information.**

LINCOLN AERONAUTICAL INSTITUTE, (INC.)
LINCOLN AIRPLANE & FLYING SCHOOL DIVISION
525 Aircraft Building, Lincoln, Nebraska

LINCOLN AERONAUTICAL INSTITUTE, (INC.)
LINCOLN AIRPLANE & FLYING SCHOOL DIVISION,
525 Aircraft Building, Lincoln, Nebraska

Name..... Age.....
Address .....
City..... State.....

I changed myself from a 97-lb. weakling to winner of title, "World's Most Perfectly Developed Man." Let me prove that my secret of Dynamic Tension can give you powerful muscle, smashing strength, a handsome build? All I ask is a 7 DAY TRIAL. Write for my 48-page FREE BOOK. CHARLES ATLAS, Dept. 65, 115 East 23rd Street, New York City.

STUDY **ENGINEERING** AT HOME

EARN A **DEGREE** AT HOME

From A Chartered Institution Of Higher Learning
Employers Demand Degree Men For Key Positions

88 Degree Courses in Electrical, Civil, Mechanical, Drafting, Architectural, Automotive, Steam, Diesel, Aeronautical, Radio, Structural, Mining, Industrial, Highway, Petroleum, Marine, Refrigeration, Air Conditioning, Chemical Engineering; Arts; Sciences; Philosophy; Education; Public Health; Psychology; Sociology; Physics; Chemistry; Geology; Pol. Science; Theology; Law; Agriculture; Business Training; Accounting; Statistics; Adv.; Sales. Founded 1908.
McKinley-Roosevelt Graduate College, 4750-D Sheridan Road, Chicago

HERE'S WORK For You!
EARN GOOD MONEY

Be our representative in your locality for Dove Work Garments. No experience necessary. Pleasant, simple work. Every business prospect. Advertising embroidered on garments great sales feature. Increase your income every week. We supply everything needed to start at once, including FREE OUTFIT. Write immediately. BEN DOVE GARMENT CO., 801 S. Fourth St., Dept. 798, Kankakee, Ill.

WELDERS (ELEC. & GAS) and **COLLISION MEN**

TRAINED MEN IN DEMAND!

Thorough, complete, practical courses in Arc and Acetylene Welding—Auto Body and Fender Repairs, in one of the finest equipped schools in the country. Welding course includes Aviation, Marine, Pipe and Structural Welding—alloys, etc. Auto Body and Fender course covers every phase of collision repair work. ACTUAL SHOP PRACTICE. Special low tuition rates. Write today for FREE TRIAL PLAN. Licensed by state of N. Y.
ACME TRADE SCHOOLS, Inc., 161 W. 64th St., N. Y. City

FREE TRIAL PLAN!

CARTOON YOUR WAY TO SUCCESS!

DON'T COPY - LEARN TO ORIGINATE!

RAYE BURNS will teach you HOW to CREATE ORIGINAL CARTOONS at home that you can SELL! Course has 26 lessons and 600 illustrations. Send name and address for free details. Only.... **$2.85**

RAYE BURNS SCHOOL, Dept. F-4, Box 2194, Cleveland, Ohio

FOLLOW THIS MAN

Secret Service Operator No. 38 is on the job! Running down dangerous Counterfeit Gang. Telltale finger prints in murdered girl's room.

Free *The Confidential Report Operator No. 38 made to his chief. Write for it.*

Earn a Regular Monthly Salary

YOU can become a Finger Print Expert at home, in your spare time, at small cost. Write for confidential full report and details. Literature will be sent only to persons stating their age.

INSTITUTE OF APPLIED SCIENCE
1920 Sunnyside Ave.
Dept. 2383 Chicago, Ill.

Through The Periscope

[*Continued from page 27*]

By Jimmy Caborn

"Now do you believe it leaks?"

We've been reading with interest about Cuthbert the Great, the two-headed trout who is now a preserved specimen in the American Museum of Natural History, in New York. Cuthbert began his career as a tiny two-headed embryo fish in the Mount Shasta Fish Hatchery in California. Two-headed embryos are fairly frequent in hatcheries, but none ever survive under natural conditions. That Cuthbert lived to adult trouthood was due entirely to the care lavished upon him by a member of the hatchery staff who adopted him and brought him up "by hand."

Having two wide mouths to eat with, and only one stomach to feed, pampered Cuthbert naturally grew very fat. "By the time he was five years old, Cuthbert was the fattest fish I ever saw," states Dr. E. W. Gudger of the American Museum staff. "He even had a ring, or groove, in each of his two back-of-the-neck regions such as one finds on the neck of a fat man."

Cuthbert finally attained a length of eight inches, and a girth of seven, and he weighed eight ounces.

He lived to be seven years old, a ripe old age for a trout, and those who knew and loved him say that he enjoyed every minute of the time, which isn't so strange after all . . .

Everybody knows two heads are better than one.

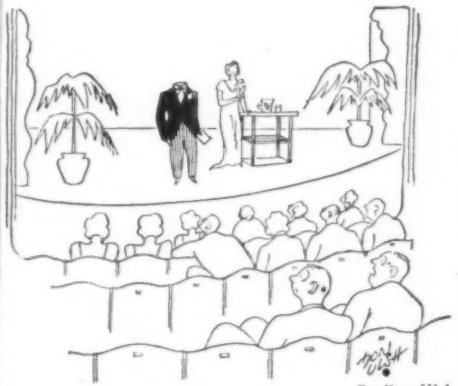
[*Continued on page 29*]

Through The Periscope

[*Continued from page 28*]

Ray Kelly, NBC's chief sound technician, tells us that the most frequent sound effect used in radio is that of a door opening or closing, and it reminds us of one of our favorite stories. When radio was very young, sound effects were a great problem, and probably the greatest one of all was the sound of a door closing. The early radio sound effects men lost enough sleep over this one noise to kill most ordinary men. They labored mightily, and for a long time, in vain. They tried hitting a drum with a drumstick. They tried dropping a book on the floor. They clacked castanets and walnut shells together; they worked on complicated machines, which, when set in operation, would give off the sound of a door being slammed, but the machines failed miserably. They were just about at the end of their rope when some unknown genius was stricken with an inspiration, and the problem was solved forever!

Yes, you guessed it—they tried slamming a door!

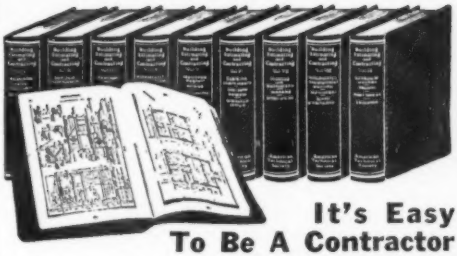


By Don Ulsh

"Professer Grigsby has just returned from an expedition among the head hunters of Borneo."

For our "That's Too Bad" department: A science bulletin tells us that the current wars have brought a shortage of good human skulls. It might be guessed, offhand, that it would be just the other way around, but the bulletin informs us otherwise. Skulls and skeletons seen in schools and doctors' offices are seldom home-grown, but mostly imported, and war conditions in Europe and the Orient combined with greatly curtailed shipping facilities threaten a serious shortage. Today, a fine quality skull, perfect with natural teeth, costs around $32. Second rate skulls with slight defects but entirely suitable for general study are $15.

[*Continued on page 30*]



It's Easy To Be A Contractor

Learn to estimate, to plan buildings, to take contracting jobs, and make money on them. Here are 9 up-to-the-minute books on building, estimating, and contracting which cover in an interesting way, the subjects that carpenters, builders, and contractors should know to make the most out of their jobs. The Steel Square, Architectural Drawing and Design, Estimating, Painting and Decorating, Heating, Air Conditioning, Building, Contracting, and other subjects are all well covered.

"Boss" Carpenters in Demand

BRAND NEW 1940 EDITION

Vast public works jobs, immense projects, and the rapid growth of home building, are making jobs for MEN WHO KNOW HOW. These books give you quick training. With them you won't be afraid to tackle any job, for needed facts can be found in a hurry.

These books just off the press in 1940 are the most up-to-date, complete we have ever published.

Coupon Brings Nine Books FREE For Examination

AMERICAN TECHNICAL SOCIETY (Publishers—Home Study Courses)
Dept. G5320, Drexel at 58th Street, Chicago, Illinois

You may ship me the new 1940 edition of your nine big books, "Building, Estimating and Contracting" without any obligation to buy. I will pay the few cents delivery charges only, and if fully satisfied in ten days, I will send you $2.00, and after that only $3.00 a month, until the total price of only $29.80 is paid. I am not obligated in any way unless I keep the books.

Name _____

Address _____

City _____ State _____

Please attach a letter stating your age, employer's name and address, and that of at least one business man as a reference.

BE A RAILWAY TRAFFIC INSPECTOR

Train With Us — Splendid Opportunities

Men — 19 to 50 — who complete easy, home-study course in spare time are placed *as Railway and Bus Passenger Traffic Inspectors* at up to $135 per month, plus expenses to start, or *we refund tuition.* Agreeable, interesting work. Ask about our 21 yrs.' experience in giving this service Free Booklet on request.

Standard Business Training Institute, Div. 6105, Buffalo, N. Y.

BENJAMIN AIR PISTOL WITH HAND PUMP

For Targets—Small Game—Camping—Etc. Guaranteed—Accurate—Practical—Economical—Safe—Clean—Quiet. Adjustable Force—Amazing Maximum Velocity. No Smoke or Fumes. Bolt Action—Hammer Spring—Hair Trigger—Safety Lock—Hand Pump. Single Shot BB $8.50; Single Shot cal. 177 or 22 with rifled barrel $8.50; BB 8-Shot $10.00; Holster $2.00. Also a complete line of Benjamin Genuine Compressed Air Rifles for BB and cal. 177 or 22. No license required from dealer or factory. Write today for complete specifications and free targets.

BENJAMIN AIR RIFLE CO., 830 Marion St., St. Louis, Mo., U. S. A.

Be a RADIO SERVICE EXPERT LEARN AT HOME IN SPARE TIME

Clear, simple, fascinating lessons—practical work with experimental kits—make training easy and fast. Up to date R.T.A. methods, under personal guidance of prominent engineer and educator, highly endorsed by leaders in radio industry. Spare-time profits soon pay for training.

START *NOW*— have your own business or fit yourself for well paid work with radio dealers, in factories, police, marine or television fields. DON'T DELAY! Send AT ONCE for complete information and Big Opportunity **BOOK *FREE!***

RADIO TRAINING ASSOCIATION OF AMERICA
4525 Ravenswood Ave., Dept. MI-50, Chicago, Ill.

To all viewfinder squinters:

THIS PHOTO PUBLICATION WILL

OPEN YOUR EYES!

A FAWCETT PUBLICATION

The Mark of Better Magazines

IF you haven't already seen the new issue of GOOD PHOTOGRAPHY No. 4, a pleasant surprise is in store for you. This issue contains over 80 pages of the best pictures of the season, plus practical articles on filters, diffusion, still-lifes, purism, etc. Two special articles will appeal to every photographer. These are on nude photography, by a nationally famous instructor, and color photography, by one whose work has been acclaimed the world over. The color illustration accompanying the latter article is spectacular!

GOOD PHOTOGRAPHY No. 4 is replete with information on taking and making superior pictures. If you are an addict for characterization, the story on photographing famous characters will appeal to you. But whatever your photographic inclinations, you will find this issue the most interesting and informative of any photographic publication. Only 50 cents!

CUT OUT AND MAIL TODAY!

Fawcett Publications, Inc., MI-5
Greenwich, Conn.

Enclosed find money order, check or stamps in the amount of 50 cents. (No coins.) Please send me, postpaid, a copy of GOOD PHOTOGRAPHY No. 4.

Name .....

Address .....

City ..... State .....

Through The Periscope

[*Continued from page 29*]

The European war is taking heavy toll in England, but not as the experts predicted. The automobile, rather than the airplane and submarine, has been the deadliest weapon since the outbreak of hostilities. Blackouts receive the blame for the alarming accident record, which has seen the highway traffic death rate more than doubled. Gruesome as these figures are, they offer a splendid idea for American defense. If and when the enemy attacks our shores, the President could declare a national holiday, thereby letting our Sunday drivers loose for picnics and pleasure trips . . .

How could we lose?

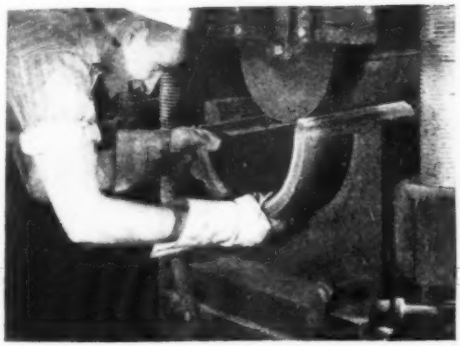
—Cliff Taylor

By Don Ulsh

"I want one of those gadgets that will shut off the radio . . . next door."

A Frenchman, who in 1903 dropped a bottle containing collodion and observed that it did not shatter, is credited with discovering the principle of safety glass.

Steel Mills Run On Cloth Bearings

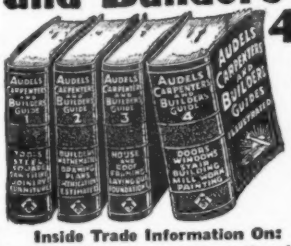


Like boats and balloons, the nation's steel industry these days depends on cloth for smooth sailing. And therein lies an unsung chapter in the astounding career of America's "synthetic age," for Micarta is a "plastic," made of cloth saturated with a synthetic resin and baked and squeezed until it is hard and as strong—pound for pound—as steel.

Moulded in a semi-circular block, a Micarta roll neck bearing weighing no more than 50 pounds carries a million-pound load when at work supporting a giant rotating roll in a modern steel mill. Fabric bearings have frequently withstood such tremendous pressures long enough to roll over 200,000 tons of steel, and in some instances they have rolled 450,000 tons before being replaced. These figures are cited by steel mill engineers in comparison with an average of 2,000 tons formerly rolled on bronze bearings.

Ten years ago steel men were incredulous at the idea of such a puny Samson carrying the burden of their great mills, but the intervening years have witnessed the adoption of fabric bearings in practically every mill in the land.

AUDELS Carpenters and Builders Guides 4 vols. $6



Inside Trade Information for Carpenters, Builders, Joiners, Building Mechanics and all Woodworkers. These Guides give you the short-cut instructions that you want—including new methods, ideas, solutions, plans, systems and money saving suggestions. An easy progressive course for the apprentice and student. A practical daily helper and Quick Reference for the master worker. Carpenters everywhere are using these Guides as a Helping Hand to Easier Work, Better Work and Better Pay. To get this assistance for yourself, simply fill in and mail the FREE COUPON below.

Inside Trade Information On:

How to use the steel square—How to file and set saws—How to build furniture—How to use a mitre box—How to use the chalk line—How to use rules and scales—How to make joints—Carpenters arithmetic—Solving mensuration problems—Estimating strength of timbers—How to set girders and sills—How to frame houses and roofs—How to estimate costs—How to build houses, barns, garages, bungalows, etc.—How to read and draw plans—Drawing up specifications—How to excavate—How to use settings 12, 13 and 17 on the steel square—How to build hoists and scaffolds—skylights—How to build stairs—How to put on interior trim—How to hang doors—How to lath—lay floors—How to paint

THEO. AUDEL & CO., 49 W. 23rd St., New York City

Mail Audels Carpenters and Builders Guides, 4 vols., on 7 days' free trial. If O.K. I will remit $1 in 7 days, and $1 monthly until $6 is paid. Otherwise I will return them. No obligation unless I am satisfied.

Name.....

Address.....

Occupation.....

Reference..... MM

LES — Correspondence Courses In RADIO and ELECTRICAL ENGINEERING — SPECIAL Only $25

ELECTRICAL ENGINEERING Get good grasp of wide electrical field. Prepare yourself, at Low Cost, for secure future. Modern course. So simplified anyone can understand quickly.

RADIO ENGINEERING Extra fine course in radio, public address, photo-electric work. Trains you to be super-service man, real vacuum tube technician. Experimental kits furnished. Diploma given on completion. Tuition, ONLY $25, either course. Deferred payment plan available.

FREE! Send name quick for free copies of school catalogs, student magazines, complete details. SEND NOW.

LINCOLN ENGINEERING SCHOOL, BOX 931-MI7, Lincoln, Nebr.

"HOW TO BUILD IT"—ALL NEW!

Packed with useful and fascinating home workshop projects, this profusely illustrated 146-page book is the finest of its kind ever to be offered to the home workshop fan. Contains articles on woodworking and metal projects, radio, power bike, hammered copper ware, lamps, glass blowing, water skis, tennis table, and dozens of other projects that will open new vistas for the home workshopper. 50 cents at your newsstand, or postpaid from

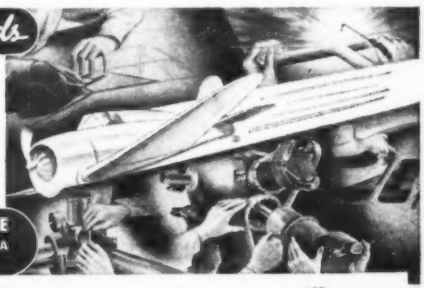
FAWCETT PUBLICATIONS, Inc.

Fawcett Building Greenwich, Conn.

HANDS LIKE YOURS . . . *Trained Hands*

ARE BACK OF EVERY PLANE

How can YOU possess the trained hands—and *trained mind*—needed for a career in Aircraft Mechanics or Aeronautical Engineering? The answer found by hundreds of men *already* in Aviation is *Aero ITI training. Find out* about this profitable training. *Find out* which Aero ITI course best fits your needs and circumstances. Many trained hands now in Aviation are there because they filled out a coupon like the one below. Send it in NOW.



AERO INDUSTRIES TECHNICAL INSTITUTE

5265 W. SAN FERNANDO ROAD LOS ANGELES, CALIFORNIA

★ *Five Courses in AIRCRAFT MECHANICS and AERONAUTICAL ENGINEERING*

Aero Industries Technical Institute, 5265 W. San Fernando Road, Los Angeles, Calif.

Please send information on Aviation careers and Aero ITI training. I am interested in the following branch of Aviation: ☐ Aircraft Mechanics. ☐ Aeronautical Engineering; ☐ Undecided. Please send more information.

NAME_____ AGE_____

ADDRESS_____

CITY_____ STATE_____ A-74-M

How to Perform PROFESSIONAL MAGIC for Fun and Profit

SEND for the big new 345-page MODERN MAGIC MANUAL and let a famous magician show you how to mystify friends and audiences with hundreds of amazing tricks known only to the profession. Read minds and sealed letters; make cigarettes appear and vanish; make watches fly; make knots untie themselves; pass a dollar bill into an uncut lemon—hundreds of startling effects, many brand new, closely-guarded secrets of master magicians are explained in detail with step-by-step instruction on how to do each trick and become a successful performer.

250 Illustrations Show You How

Easy-to-follow drawings by Nelson Hahne himself a noted magician, show exactly how to produce the effects so mystifying to beholders. And the hundreds of tricks set forth require only simple apparatus—or none at all. Many of the most startling are the easiest to do—when you know how.

Take advantage of this unique opportunity to master professional magic now. Tear out this ad. Write name, address, business connection in margin. Mail to Dept. X, Harper & Brothers, 49 E. 33rd St., New York. Book will be sent at once. Within 5 days send $3.50 or return book . . . If no business connection, send cash. Full refund guaranteed if book is returned within 5 days.

Examine It 5 Days FREE

Big Money for Workers In Home or Shop

MONEY-MAKING PROJECTS. Color-glazed concrete pottery, garden novelties, statuary, giftware, cemetery products, gravestones, tiles, walls, floors, etc. Basement waterproofing. New, patented method makes concrete pottery without molds, cores or costly tools. Use only sand, cement, cheap materials. No experience needed. Get the facts about these new money-making projects NOW. Send 3c stamp TODAY for booklet, colorplate, details.

NATIONAL POTTERIES COMPANY
Dept. 8 13 W. 26th St. Minneapolis, Minn.

GOOD PHOTOGRAPHY NO. 3

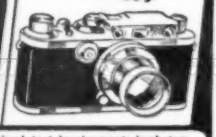
Nobody interested in taking and making better pictures should miss this 144-page book. Contains authoritative articles on all phases of photography, and is lavishly illustrated with 80 salon prints. 50 cents at your local newsstand, or postpaid from:

FAWCETT PUBLICATIONS, Inc., Greenwich, Conn.

FREE

First Step to Successful Pictures
Send for Central's 64-Page
BARGAIN BOOK!

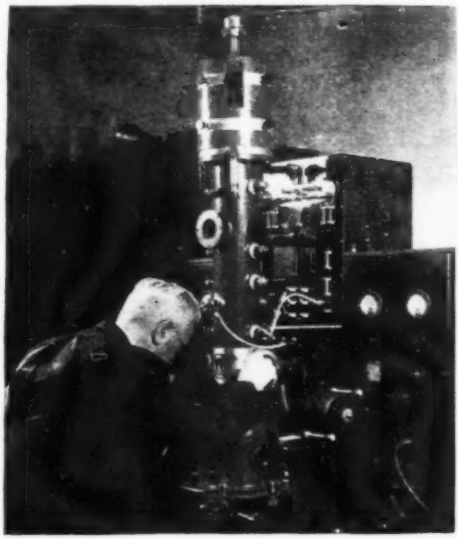
HEADQUARTERS FOR PHOTO SUPPLIES Since 1899



Free illustrated catalog listing latest developments in photography and Home Movie Making, for fun and profit. Offers hundreds of new and used still, movie, Cameras, Lenses, Films, Exposure Meters, Enlargers, Darkroom Supplies—everything photographic. All guaranteed—many at big savings. Central offers you America's most complete, varied stock. Liberal trade-ins on cameras and equipment. Write now for free copy of this newest money-saving bargain book—just out. Limited edition. Hurry!

CENTRAL CAMERA CO., 230 S. Wabash Avenue Dept. E-11, Chicago, Ill.

Can Of Air Solves Electron Beam Puzzle



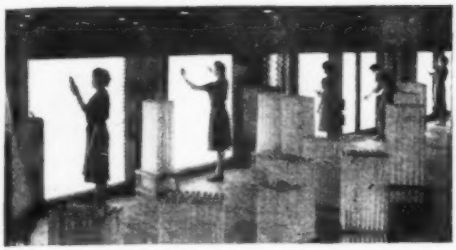
An electrical design engineer recently demonstrated how a pint can of ordinary air has been made to control current from 50,000 volts in a camera mechanism that "takes pictures" in less than a millionth of a second.

Refined as a small metal bellows, the can of air has been applied as an air pressure regulator on a cathode ray oscillograph developed by the Westinghouse Electric & Manufacturing Company for the new high voltage laboratory of the United States Bureau of Standards at Washington, D. C.

The four-foot vacuum tube of the cathode ray oscillograph looks like an over-sized radio tube, and to a degree it operates like such a tube. Propelled by some 50,000 volts of electricity, the air molecules inside the tube hurl themselves against a metal cathode at the top of the tube with such force that electrons (negatively charged submicroscopic particles) are driven out of the cathode and sent dashing down the tube at speeds in the neighborhood of 60,000 miles a second—approximately one-third the speed of light.

These electrons are temperamental actors; they refuse to give their best performance until sufficient billions of air molecules have been pumped out of the tube to bring its air pressure down to about one fifty-thousandth that of ordinary atmospheric pressure. But if too much air is removed from the tube the electrons are also reluctant to travel, and it becomes necessary to throttle microscopical quantities of air back into the tube in order to increase the flow of current, create an electron beam.

Fluorescent Lamps Increase In Popularity



Racks upon racks of luscious-colored fluorescent lamps are being constantly filled, tested and emptied at the General Electric Fluorescent Lamp Works, Nela Park, Ohio, where twelve thousand lamps a day are now passing through this "aging" test. Girls run an induction coil, and sometimes their hands up and down the lamps to light them as if my magic. Foreign gasses in the lamps are thus cleaned up and the lamps leveled off so that when sold they will start normally.

Fluorescent lamps are satisfactorily answering such specific needs as these: For an extended source of cool light; a highly efficient means of producing a close approach to natural daylight; and, a source capable of emitting a wealth of rich colored light for display and decorative lighting effects.

Benefiting in turn from the greater use of these more efficient lamps will be those industries making the fixtures, special sockets and auxiliaries for the bulbs. These industries, to date, have enjoyed business several times the value of the lamp department's in the fluorescent field.

First large orders filled were for the New York World's Fair and the San Francisco Golden Gate Exposition.

U. S. Manufacturers desire men to learn Electric Arc Welding and get practical experience under actual production conditions in the laboratories of the School of Engineering. Moderate training Fee. Accepted applicants will be fully trained until ready to pass rigid test and assisted in securing employment.

AIRCRAFT WELDING "We want more planes!" That's the demand on every side. No wonder there is a shortage of aircraft welders. Other industries need welders, too. There's almost no limit to what Milwaukee School of Engineering trained welders can do. They get good pay because they know the "how and why" of Welding, Metallurgy, Drawing, Blueprint Reading, Set-up Work and Fabrication—and they enable manufacturers to cut production costs. Remember—industries need practical trained Aircraft Welders, Arc Welding Operators, Technicians and Welding Engineers, and Air Conditioning and Refrigeration Technicians. Don't be satisfied to struggle along on ordinary, hit-or-miss jobs with poor pay—when in a short time you can become a trained specialist. **Send coupon today.**

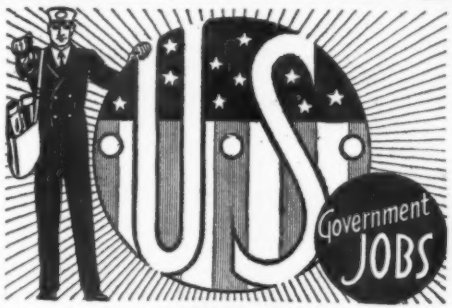
MILWAUKEE
SCHOOL of ENGINEERING
Institute of Electrotechnics

MI-540 North Broadway and E. State, Milwaukee, Wis.

Without obligation send Free Booklet "The Dawn of a Gigantic Industry and its Outstanding Opportunity." Also tell me How to Become an

Arc Welding Operator (3 mo.)_ Air Conditioning & Refrig. Tech. (4 mo.)_
Air Craft Welder (6 wks.)_ Radio Serviceman (6 mo.)_
Welding Technician (5 mo.)_ Commercial Electrical Engineer (1 yr.)_
Welding Engineer (1 yr.)_ Commercial Radio Engineer (1 yr.)_
Electrical Engineer Student Loan Plan_
B. S. Degree (4 yrs.) Earn Part Expense Plan_

Name_ Address_
City and State_ Age_ MI-540



START
$1260 to $2100 YEAR
MEN—WOMEN

Over 52,000 Appointments in 1939 Government Year.

Thousands Appointments Yearly.

Short hours. Dependable jobs.

Mail Coupon Today—SURE

COUPON

Franklin Institute
Dept. C254
ROCHESTER, N. Y.

Gentlemen: Rush to me FREE of charge, list of U. S. Government big pay jobs. Send me FREE 32-page book describing salaries, vacations, hours, work, and full particulars telling how to qualify for one of these jobs.

Name .....

Address .....

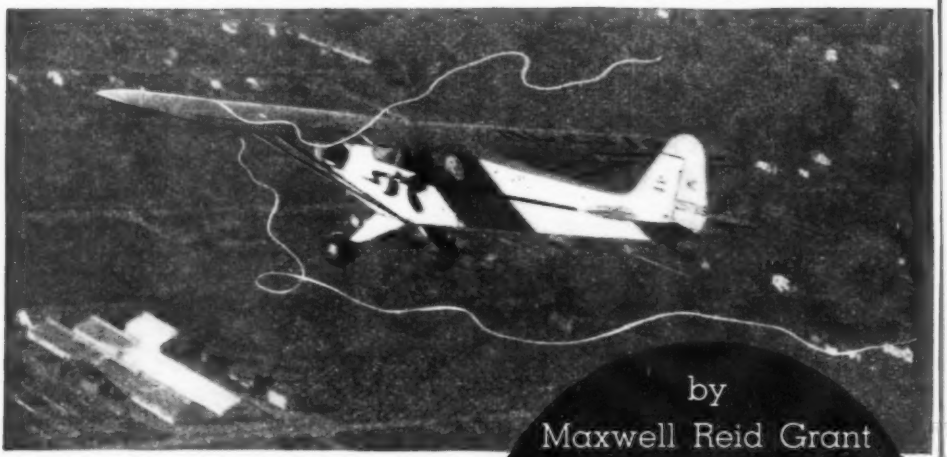
Vol. XXIV
No. 1

MECHANIX ILLUSTRATED

MAY
1940

AIRATHON — —

What is This Flying Sport?



In the paper strafing event, the pilot tosses out a roll of paper tape at 2,500 feet, then tries to cut it twice with his wings, while judges hold a stopwatch on him. The plane has just contacted the tape for the first cut, after which it will have to turn and come back to slice one of the two pieces left in the air.

by
Maxwell Reid Grant

College students all over the country, aided by the government, are earning their wings. It is only natural that a new and thrilling collegiate sport should develop, combining skill and daring high in the heavens—the "Airathon."

THE score was tied, 11-11, with only one event left to go. Would the Southern team, fighting desperately to hold the intercollegiate title, be able to offset the loss of its best man, grounded by an eye injury?

Motors hummed overhead. Heads tilted upward as a low-wing monoplane came straight over the field. In the judges' stand, stopwatches clicked as a long ribbon of white suddenly unfurled in the plane's wake and gently floated earthward.

Abruptly the pilot wheeled and came back in a quick dive. His propellor sliced the streamer and neatly clipped off the lower end. The motor roared as he zoomed quickly, banked in a sharp return, and again pounced upon the white ribbon, parting the main strand in the middle and sending it curling in tattered shreds.

Through the roar of applause cut the announcer's voice from the loudspeakers:

"Official time for the paper strafing event, twenty-one seconds. Score now, 16-11."

The tie was broken—a good pilot's deftness with the controls had won the title in this newest of collegiate sports, the "Airathon."

Already, the landing field is beginning to compete with the gridiron, cinder track, and diamond as an arena of college sports. In

One of the contestants leans out of the plane cabin to attempt a bull's-eye in the supply dropping event. A good eye for distance and accurate judgment of speed and wind currents are needed for success. Right: These lads, corresponding to football's waterboys, are loading the sacks to be dropped with flour.

Members of the ground teams stand in the large white circle and look up to see how the pilots are doing. The white spots are where flour filled bags have fallen.

both East and West, big-league universities are holding local meets for the regional championships, and the "Rose Bowl" game of the air is the national match held annually at Gambier College in Ohio for the U. S. title. With 15,000 college students now being trained to fly under the Federal government's new civilian training program, more than 400 universities will have opportunity to groom flying teams, and a big influx of entrants into future meets is expected. About half the college pilots at present own their own planes, but with large numbers of green recruits

Part of the spectators who have gathered to watch the "Airathon." With 15,000 college students now being trained to fly by the government, more than 400 colleges and universities will have the opportunity to groom teams for this fast growing new intercollegiate sport.

turning out for the competitions, rented planes will figure more in the sport. Ordinarily it costs $5 to $10 an hour to hire a good plane, and flying time enough to qualify for a government license costs real money; but with Uncle Sam furnishing not only free flying instruction, but the use of planes as well, the cost of becoming a pilot is approaching zero. That's why a boom in aerial sports seems inevitable.

Uncle Sam's instructors are friendly to the idea because the sport develops a pilot's ability to handle the controls with precision and dash. Good flying, and nothing else, will win out, and the man who works up to championship rank is bound to be a good pilot.

Take the balloon bursting competition, for instance. A pilot goes to 2,500 feet, flies directly above the judging stands, and tosses out a small toy balloon, then dives and twists until he has punctured it by flying into it. Fast work is required for this event.

Next he drops to 1,000-foot altitude, cuts

Above: Judges and timers keep track of each contestant. The contest is scored like a track meet, five points for first place, three for second, two for third, and one for fourth.

The official starter sets the planes off much as in an auto race. Already, in both east and west, universities are holding local meets for regional championships.

A pilot dives his plane straight at a toy balloon in the balloon bursting competition. Right: Two co-eds lend their lungs to the new sport by blowing up some of the balloons needed in this event.

his motor, and glides to a spot landing, with the object of dropping his tail skid directly on a white line ruled across the field. Like football linesmen, the tape crew measures each attempt, and the pilot who comes nearest to hitting the line wins first place.

In the paper strafing event, the pilot tosses out a roll of paper tape at 2,500 feet, then tries to cut it twice, while judges hold the stopwatch on him. Next he comes in for a dead-stick "bull's-eye" landing, trying to drop his tailskid inside a round marked area about twenty feet across.

A good eye for distance, plus accurate judgment of speed and of wind currents, is required for "supply dropping." Aiming at the center of a large white circle marked out on the field, the pilot leans out and drops a lime-filled paper bag. His shot registers as a white spot, making it easy for the ground crew to measure how close he came. Now and then a pilot actually hits the bull's-eye, but to land a shot within the circle itself is a creditable feat. Skill gained in these competitions is expected to count later on, when in times of major disaster volunteer flyers are drafted to drop supplies to marooned refugees.

A college "Airathon" is scored like a track meet—five points for first place in each event, three for second place, two for third, and one for fourth. Last year, the Pacific Coast championship was won by the University of Southern California, with Bill Flannagan, crack pilot and this year's captain, running up twelve out of the twenty-seven points garnered by Trojan fliers. But early this season, Stanford University, out to avenge last year's defeat, trounced the Southern California team, 28 to 16, in a preliminary meet, winning back the red hatchet symbolizing the old feud between the two schools. Later will come a four-way playoff, with the University of California and San Diego State Teachers'

Left: Contestants don parachutes before going up to take part in the various competitive events. Government authorities believe that the sport will develop a pilot's ability to handle the controls of a plane in a crisis.

The captains of two California college flying teams wish each other well before the start of the "airathon." The goal of the teams is to win local and regional competition so that they may go to Ohio on June 22 to take part in the national championship meet.

College also participating, and the winner will go to Ohio on June 22 to meet the Eastern winner in a battle for the national championship.

A good many college fliers belong to the first—and so far, only—national aviation fraternity, Alpha Eta Rho, whose emblem is visible on most of the planes in the contests. The sport is too new to have a well-established set of records for contestants to shoot at, but so far, the record for balloon bursting, for instance, is nine seconds, a mark established by Jack Martin of the University of Southern California team, who went straight from his college flying to a berth on one of the big airlines. Strangely, this year's high-point man on the team was Stan Smith, who had just received his pilot's license and was quite new at the business of flying.

Sports enthusiasts now are looking forward to the time when a body like the A. A. U. will develop an official system for record-keeping on a nation-wide basis, and track teams of the air may rise to Olympic ratings.

Truly, there is no telling just how far this new sport of the sky may go. Enthusiastic followers of the "Airathon" predict that in five years it will have as great an intercollegiate following as football. They point out that it takes speed, skill and daring, and has that element that makes any "big-time" sport popular, namely, crowd appeal.

They look forward to the day when crowds will fill stadiums all over the country to view the "Airathon" meets between sectional and intersectional rivals. Favorite aviators will be played up in the sports pages, and a "triple-threat man" will be one who can burst balloons, slice tape and drop flour bags with equal skill. Who knows—maybe there will be an All-American "Airathon" team picked each year!

But even if it doesn't go that far—even if it is only taken up by a small body of students, how much better it is that American youth should take its flying this way, with flour-filled bags instead of bombs, and balloons and tape as targets instead of other human beings!

You Pay To Get Clipped!

THIS gentleman is using a new machine that vends electric shaves in terminals, hotels, and other public places. A coin is dropped into a slot, the electric shaver goes into action, and the whiskers disappear. Rays from an ultra-violet lamp bathe the shaver as a sterilizing measure.

She's Taking A Tanning

FOR the young ladies who weren't able to pick up a fashionable Florida tan during the winter, this spray machine is the perfect answer. It gives a nice coat of imitation tan, using a non-irritating oil base, and it will wash off when you get tired of it!

"Airacobra" Is Army's Latest Fighting Plane

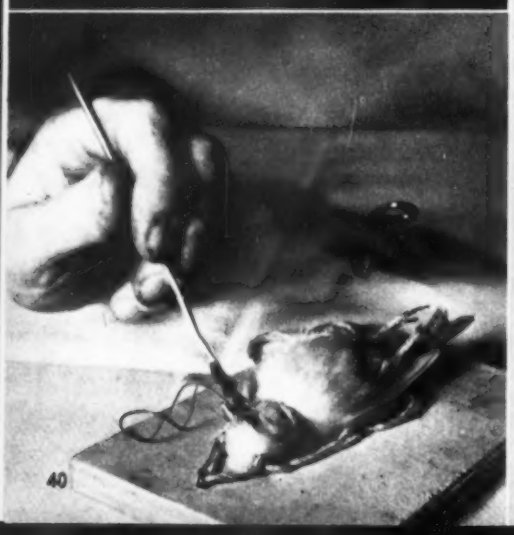
THE last word in fighting planes is the U. S. Army's new "Airacobra," designed for a speed of 400 miles an hour and an altitude of 36,000 feet. In addition to four machine guns, the ship will carry a 37mm. cannon firing high explosive shells—all operated mechanically by the push of a button in the pilot's cockpit. Radical in design, the plane's motor is behind the cockpit.

"Doc" Lambert uses the stethescope to listen to a canary's heart beats. Weak hearts among pet birds are not uncommon, due to the size and fast action of their hearts.

Left: A canary suffering with pneumonia is provided air for breathing by Pat Lambert, who is gently blowing through the rubber tube.

Chirpers Are Cured

Feathered songbirds get sore throats, too! A wire brace holds the bird's mouth open, as its throat is swabbed with a weak argyrol solution.



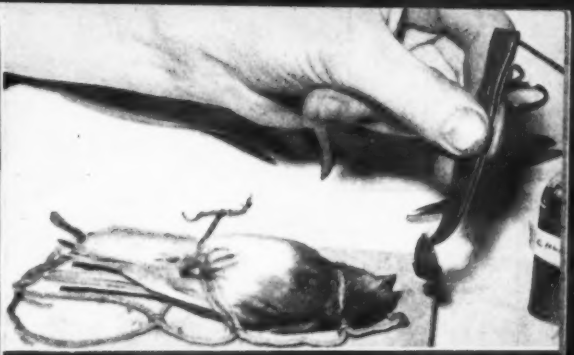
BIRDS as a hobby date back to the crusades when falcons were used for hunting game. In later years, nature students developed a trend to smaller birds resulting in the popularity of the canary, for example, as house pets.

Patrick Lambert's interest in birds began as a hobby and he now ranks as one of the 30 bird specialists in this country. Bird surgery has been practiced in the United States comparatively recently but it is claimed to have originated in Germany several hundred years ago.

This interest in bird surgery as a hobby started 15 years ago when he successfully set the broken leg of a baby sparrow which had fallen from it's mother's nest. Since then he had treated birds of all kinds, domestic and foreign, for ailments and accidents to which they are subject. These range from an inquisitive parrot who walked into an

A sling is used to accommodate a bird while its injured leg is healing. The sling will be pinned to the top of the cage, with food and water in easy reach of the convalescent.

Broken legs and wings are common among bird pets, and this little fellow's leg has just been put in splints of hard wood with binding of adhesive tape.



On the operating table—this canary is about to receive an anesthetic before having a wing tumor removed.

In CANARY CLINIC

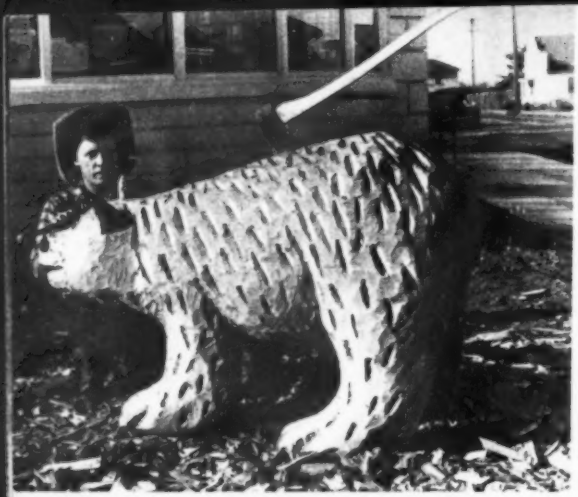
electric fan thereby sustaining a broken leg and wing, to a canary blinded by lightning. This canary was made totally blind and had to be taught to bathe and where to find its seed and water. Not being able to recognize daylight the bird would often start singing at midnight.

Lambert finds that the most common ailment with house birds is the common cold caused by drafts and improper heating. He considers canaries as natural hardy creatures and is now experimenting to prove this theory by using an outdoor aviary where the temperature has reached 10 degrees with no apparent harm to the birds which have occupied it since May.

Lambert's laboratory is in his home at Jersey City. He has made most of his equipment himself, designing it especially to suit the particular "case" and operation requirements. The operating "table" for small birds is a piece of plywood measuring 4x6 inches with eight screw eyes located as shown in the photographs. A light cord is laced through these screw eyes across the bird and holds it securely without injury to feathers or other parts, yet permits a clear "field" for operating. Larger boards are rigged in the same manner for operating on larger birds.

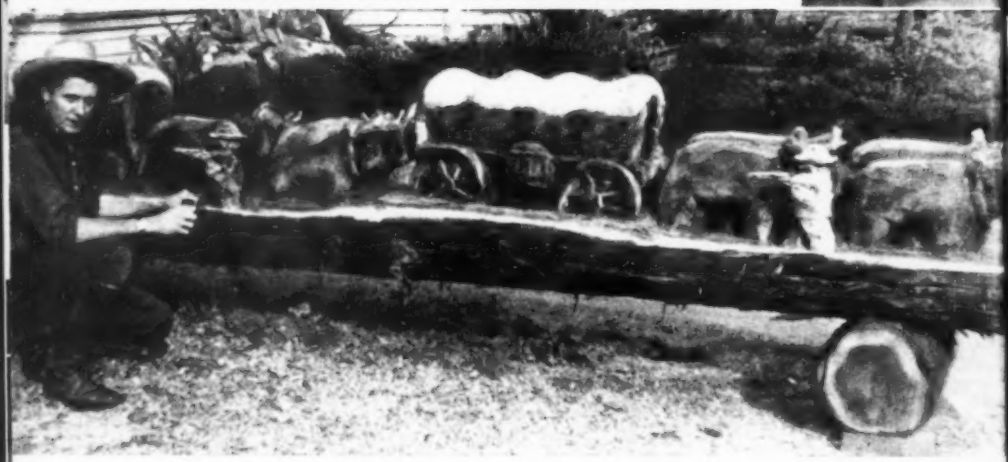
At the present time, Lambert is pursuing his hobby while employed as a bird consultant in a large New York department store. An indication of the great interest shown by owners of feathered pets is the fact that he answers approximately 400 inquiries a week concerning bird habits, diets and ailments.

As a nature lover, Pat Lambert has found his hobby of bird "hospitalization" to be the most engrossing and soul-satisfying of any hobby coming to his attention.



Ambrose Gruenke reads over his clipping book, which has carved redwood covers. At the left, Gruenke is seen with one of his articles of carving handiwork—a wooden bear.

He's Carving Himself A Future



Here is a double carved wagon and oxen unit that Gruenke has carved out of a redwood log with a hand ax, at Santa Cruz, just one of the 2,800 sculptoring jobs he has finished in recent months.

AMBROSE GRUENKE, the young man from almost anywhere you care to name, has an ambition: To revive the old American art of wood carving. And he's doing pretty well, in his lone-wolf way. He estimates he has dotted the country, from the Grand Coulee Dam in Washington deep into California, with wooden bears, elephants, chickens, deer, horses, Indians and comic figures—some twenty-eight hundred of them.

Before he became a free-lance carver, Gruenke was just a handyman, carpenter, painter, boot-repairer or what have you. And then, one day, in Mount Angel, Oregon, he found himself whittling on a very authentic-looking reproduction of a covered wagon. Someone else saw it too, and bought it for a nice price.

"Heck," said Gruenke, "this is fun." And

[*Continued on page* 118]

Trick Engine Runs Two Ways

JOHN IRVINE, of Indianapolis, has invented a radical type engine, the 2-cylinder, 17-pound model of which will develop 17 horsepower. Freakish also is the fact that the motor can be reversed and run backwards. His model is a 2-cylinder, opposed type, of 4-cycle construction with a third compound auxiliary cylinder working in between one-half of the main cylinders.

This Hook Will Handle 'Em!

FISHERMEN will have to think up a new alibi for letting the big ones get away when they're using this fish-hook. Made of "Z" nickel, a new heat-treatable alloy containing approximately 98 per cent nickel, this hook resists corrosion by fresh and salt water. Steel-like strength makes it ideal for big game fish.

Paddle Or Pillow, Take Your Pick

THIS latest invention, the "paddle-ball," is a boon to those whose swimming talents have been neglected. The paddles enable them to move about, while the buoyant ball keeps them afloat. When you get tired of swimming, you can follow the example of the girl at the right, and use the ball for a comfortable pillow.

formerly Modern Mechanix

Goodby to Radio Static

Edwin H. Armstrong is unquestionably the outstanding inventor in the radio field. He was only 22 years old and a student at Columbia when he startled the world with his invention of the regenerative circuit in 1913. He followed this with the famous superheterodyne in 1917, the super-regenerative circuit in 1922, and now frequency-modulation broadcasting. The latter is revolutionizing radio.

by M. L. Muhleman

WHEN station W2XMN, at Alpine, New Jersey, first went on the air in 1937, the millions of listeners in metropolitan New York were totally unaware that something spectacular in the way of broadcasting was taking place right under their noses—oblivious to it because the peculiar radio waves hurled into space from horizontal rods on a tower high above the Palisades brought no response in conventional home receivers.

But to the few radio engineers with special receivers designed to intercept and make sense out of the transmissions came a thrill as keen as a first high dive. What they heard was broadcasting with a new voice, minus the frog in its throat and adenoids in its nose—a voice so natural, so realistic as to be almost unbelievable. And a voice as free of incidental background noise as a whisper in a tomb! It was radio with a quality of definition never before dreamed of; with sound reproduction so lifelike that it created the illusion of originating in the room with the listener. It was nothing less than a front seat in the studio.

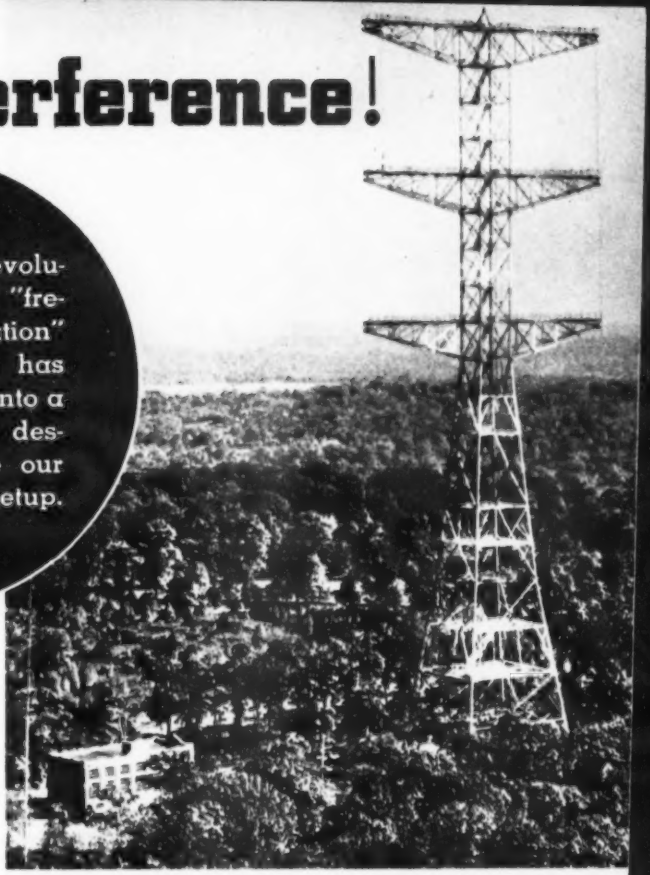
Radio engineers call the new system "frequency modulation." The word-slingers of the press have dubbed it "staticless radio," which it is. But it is far more than this, for, aside from side-stepping distortion, natural and man-made static and station interference—the three thorns in the side of our present system of broadcasting—it has a tone and volume range far beyond that of the conventional radio station.

It would seem that anything quite so revolutionary as frequency modulation would have met with overnight success. Actually, the system has practically gone begging for five years, partly because it was first introduced when television was

Frequency-modulation receivers look like any other radio sets, except that they have better sound reproducing systems. Here is the newest General Electric model, which is capable of picking up regular broadcasting as well as F-M stations.

and Interference!

The new and revolutionary system of "frequency modulation" broadcasting has shoved television into a back seat and is destined to out-mode our present radio setup.



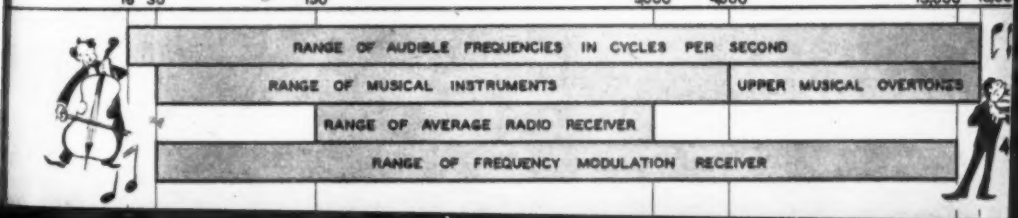
This queer-looking rig is the "turnstile" antenna of Armstrong's station W2XMN, at Alpine, N. J., pioneer frequency-modulation transmitter. It is located on the edge of the Hudson River, just across from New York City.

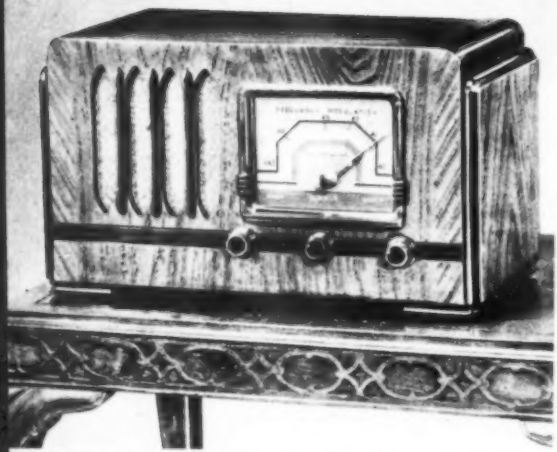
just getting under way, and partly due to its being too good! Television, after all, could be set up as a subsidiary service without disrupting the conventional system of broadcasting, and television seemed to be the very lift that the radio industry sorely needed. But frequency modulation would represent a direct frontal attack on the existing system of broadcasting and its huge investments. Or so it appeared. It would be better to let it rest until television was established, or let it die out altogether, rather than upset the status quo. And it might have died out were it not for the courage and determination of its inventor.

You'll know him if you know the name of the man who invented the regenerative vacuum tube radio circuit which made broadcasting possible in the first place; who invented the universally used superheterodyne radio receiver and, later, the super-regenerative receiver which is used commercially. In case you don't, his name is Edwin Howard Armstrong, major in the A.E.F. during the first World War and now Professor of Electrical Engineering at Columbia University. He belongs at the top of the heap of important names in radio—the Marconi of our time.

Professor Armstrong set out to do the impossible. Almost as a body, radio engineers said that static interference could not

Comparison of tone coverage of ordinary and frequency-modulation radio receivers.





If you have a high-grade receiver of standard type, you can add this Stromberg-Carlson frequency-modulation converter unit to it and listen to F-M stations. The small loud speaker in the cabinet works with the large unit in the regular receiver.

Location of Frequency-Modulation Stations

ALREADY ON THE AIR

Alpine, N. J.	Albany, N. Y.
Rochester, N. Y.	Meriden, Conn.
Schenectady, N. Y.	Paxton, Mass.
East Springfield, Mass.	New York, N. Y.
Yonkers, N. Y.	Georgetown, D. C.
Boston, Mass.	

APPLICATIONS FOR LICENSES

Marshall, N. Y.	Cincinnati, Ohio
Sargents Purchase, N. H.	Portland, Maine
	Atlanta, Ga.
Philadelphia, Pa.	Los Angeles, Calif.
Syracuse, N. Y.	Allison Park, Pa.
Kansas City, Mo.	Boston, Mass.
No. Dayton, Ohio	Greensboro, N. C.
Binghamton, N. Y.	St. Louis, Mo.
Providence, R. I.	Addison, Ill.
Chicago, Ill.	Columbus, Ga.
Detroit, Mich.	New York, N. Y.

CONSTRUCTION PERMITS

Alpine, N. J.	New York, N. Y.*
Superior, Wis.	Avon, Conn.
New York, N. Y.*	Milwaukee, Wis.
Hartford, Conn.	New York, N. Y.*
Holden, Mass.	Boston, Mass.
Los Angeles, Calif.	Whippany, N. J.
Bethesda, Md.	Superior, Wis.
Columbus, Ohio	Carteret, N. J.

*(Three different stations.)

be eliminated. It was part and parcel of received signals and the two could not be separated. It could be demonstrated mathematically that static was with us and we were stuck with it, like taxes, so why waste effort trying to eliminate it? Armstrong's reply today may be that these engineers did not say "positively."

Oddly enough, the very first thing Armstrong set out to do was to prove to his own satisfaction that, the elimination of static interference was impossible *as the problem was related to the present system of radio transmission and reception.* Then he set out to elude static altogether by devising a radio wave that was so different in character from natural and man-made static that the two could be separated in a receiver.

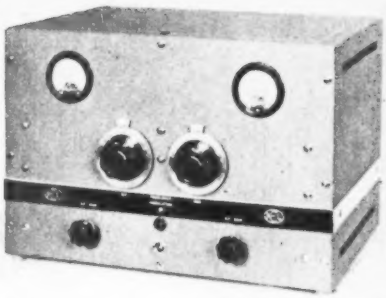
He found what he wanted in frequency modulation, which engineers avoid like a plague, for it is a sort of ague that takes hold of a radio wave of the conventional type if it isn't treated properly, and gives it the shakes. The result is nothing less than a tonal catastrophe. But Armstrong was after a wave with the shakes—a wave that would wobble when modulated, rather than one that would alter its energy level or amplitude as a conventional radio wave does. He wanted a wave that altered its frequency but not its amplitude, a wave wherein the extent of frequency shift would represent the volume of the sound and the rapidity of the change its pitch. If he could do this, and then devise a receiver that would not respond to amplitude variations as an ordinary receiver does, but respond only to changes in frequency, he could make the system sidestep natural and man-made static; for these electrical disturbances, like a conventional radio wave, change in amplitude but not in frequency.

This is exactly what Professor Armstrong has done; and, no doubt, many of the engineers who have held that the elimination of static was impossible, have since said, "Well, after all, if you do it *that* way . . ."

The beauty of the Armstrong system lies in the fact that a station having only a fraction of the power used by our big broadcasters to over-ride local background noise will provide staticless reception in an equal area. Possibly more to the point is that a frequency modulation station provides noiseless reception in the ultra-short-wave bands where man-made noise, such as that from auto ignition systems, household electrical appliances, etc., is prevalent. Stations in the standard broadcast band are packed in so close together that tonal range, which makes for naturalness in reproduction, is severely limited. But there is plenty of space in the ultra-short-wave bands for wide station channels, and it is in these bands that frequency modulation has made its home. The channels used are 200 kilocycles wide as compared to the 10-kilocycle channels in the standard broadcast band!

It is the utilization of a wide transmission channel that gives frequency modulation

This is a specially-made Radio Engineering Laboratories receiver intended only for frequency-modulation reception. The front appearance (right) is a little out of the ordinary, but the inside works (left) resemble those of conventional sets. The sound unit (below) is decidedly unusual. The small loud speaker handles the high musical notes, the large one handles the low notes.



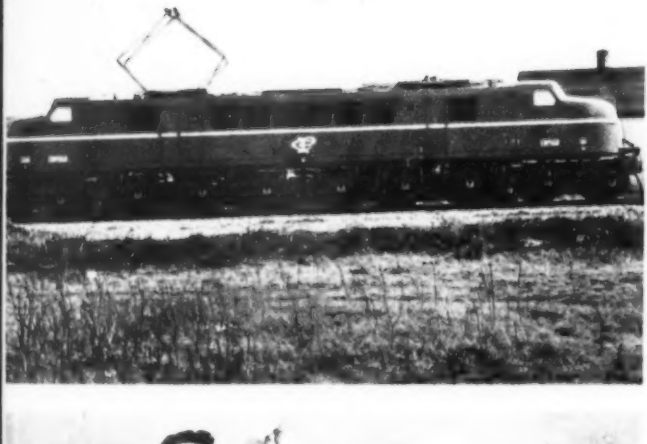
broadcasting most of its realism. The average home radio receiver has a tone range of approximately 150 to 3,000 cycles, less than the complete range covered by musical instruments. A good console receiver does a bit better than this, but falls far short of reproducing the higher overtones of sound and music which make for naturalness. The conventional broadcast station of top quality has an approximate range of 30 to 7,500 cycles, with all tones above 5,000 cycles or so made practically useless at the receiving end because of noise. But a frequency modulation station and the receivers designed for this service run clear out to 15,000 cycles—practically the entire audible range of frequencies!

But that is not all. Volume range, as well as tonal range, has an important bearing on the naturalness of sound. The volume range of a standard broadcast station is limited by the noise level at one end and overloading or overmodulation (which causes distortion) at the other end. It is necessary, therefore, to "compress" the volume range by raising the volume of soft musical passages (so that they are not lost in the noise) and lowering the volume of loud passages to prevent distortion. The result of this compression is to rob music of its tonal balance. In Armstrong's frequency modulation system, soft musical passages need not be raised above their original level since reception is against a silent background. Loud passages need not be reduced because modulation is attained by means of frequency shifts and there is nothing in the system to overload. The result is a volume range more closely approaching that of the original orchestration in the studio . . . music just about as you would hear it in a concert hall.

[*Continued on page* 124]

Engine Pre-Heater Saves Lots Of Time

THE loss of time involved in warming up airplane engines in cold weather is almost wholly eliminated with this pre-heater, now used by many of the nation's air lines. The burner, supplied with gas from the horizontal tank, sends heat up through the telescopic stack into a fire-resistant canvas shroud which is slipped over the propellers and drawn tightly around the engine of the plane.



Giant Locomotive Is Headed For Brazil

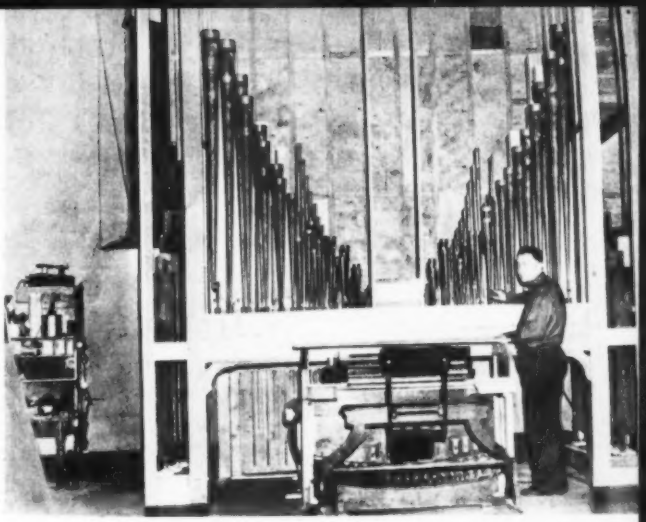
THIS locomotive is one of a group of four that were built recently in the United States for the Paulista Railway, of Brazil. Weighing 185 tons each, the giant engines are the most powerful direct current locomotives ever constructed. Approximately 75 feet long, each engine has a nominal rating of 4,000 horsepower and a maximum speed of 93 miles an hour. On a two per cent grade, one of these engines can handle a 1,000 ton train at 50 miles an hour.

Some People Would Rather Take Chances

WHICH is one of the reasons, according to the National Safety Council, that the United States has an annual occupational accident bill of around 700 million dollars. The worker shown here is clad in a forecast of what the well-dressed industrial worker may be wearing, if the Safety Council's suggestions are followed. The suit protects the wearer from fire, dust, fumes, bumps and other industrial hazards.

Indiana Prisoner Builds A Pipe Organ

JIM TREES, an inmate of the Indiana State Prison, serving ten years for robbery, is shown with the chapel pipe organ, valued at $7,000, which he built with his own hands over a three-year period at a cost to the prison of only $100. Trees, who is 38 years old, knew nothing about pipe organs when he decided to build this one for the chapel. He gained most of his knowledge from two books his mother sent him.



Wet Paint— Do Not Touch!

LOOKING like modern versions of old-time thumb screws, these odd-appearing little metal gadgets are for the purpose of providing the girls with protection for damp finger nail enamel while they answer the door or the telephone. To put them on, the rounded end of the shield is pinched, which opens it. Then it is slipped over the wet nail, and the soft rubber bands at the top keep the metal from hurting the fingers. They're supposed to be great for keeping the baby from sucking his thumb, too!

Reading Made Easier With Polaroid Film

BLACK print rendered completely invisible by glare light on a white page can be made easily readable with the insertion of Polaroid film in the path of the contrast-destroying glare light. In recent experiments it was found that a new model lamp fitted with a Polaroid film screen provided 20 per cent greater contrast between ink and paper than an identical lamp without such a screen.

Of Men And M

WHERE a decade ago several hundred miners carved out a fortune in gypsum in the 25-acre mine on the outskirts of the little town of Akron, New York, today half a dozen men, working in total darkness, except for the faint light from the torches on their helmets mine, not gypsum, but mushrooms.

Ten years ago the gypsum mine was abandoned. The stratas of gypsum had been removed, leaving 25 acres of caverns some 60 feet below the surface. Since then one of the strangest of modern industries has sprung up—the mushroom mine, yielding approximately half-a-ton daily of the world's finest and purest edible fungi!

Where steel-thewed miners once carved a fortune from the lower stratas, today the extensive caverns left by them have been converted into a silent world of perpetual darkness, populated by thousands upon thousands of pure white mushrooms, "white diamonds" which have come to command premium prices on the open market for their uniform quality.

Mushroom mining was practically unheard of when the gypsum mine was abandoned. Howard Bell, of Akron, was then operating a small mushroom business in the cellar of his home, and in a small patch of ground nearby.

While the business was fair and provided a living, there were certain drawbacks. Small animals and the mushroom gnat took a considerable toll on his product, to say nothing of making an appreciable dent in his profits.

With the abandoning of the gypsum mine and its 25 acres of caverns, Mr. Bell began to formulate plans to overcome these shortcomings. A mushroom "mine," although a radical departure, spelled the answer.

"It stands to reason," Mr. Bell argued, "if mushrooms grow best in cellars and semi-damp places where there is a more or less constant temperature, the ideal place should be a mine. It's worth investigating."

And investigate he did. He learned that the mine had a constant temperature, winter and summer, of 50 degrees. It was practically never visited by small animals, and that pest to the mushroom grower, the mushroom gnat, could be easily exterminated in a mine by proper fumigating methods.

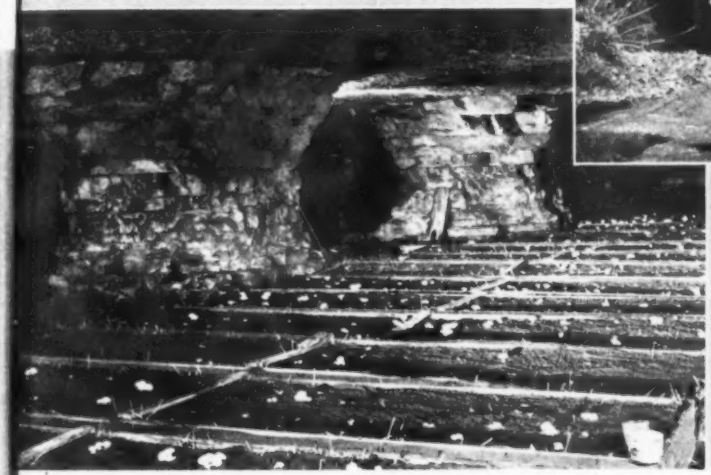
Mr. Bell leased the abandoned mine and started his operations on a small scale as a test. Within the next year he had hired additional help, and the entire 25 acres of the mine had been converted into especially built mushroom beds. Since then the business has grown into one of

Howard Bell, owner and operator of the mushroom mine at Akron, New York, examines part of his mine-grown crop of "white diamonds."

Mushrooms

Part of the daily half-ton yield of the mushroom mine. Note the fine quality and standard size of the mushrooms, due to the mine's constant, year-round temperature.

Here is the entrance to the abandoned gypsum mine which Howard Bell, shown in the picture, ingeniously converted into a profitable 25-acre mushroom mine.



Left: A partial view of the mushroom beds. The constant temperature of around 50 degrees makes it ideal for the use to which it has been converted.

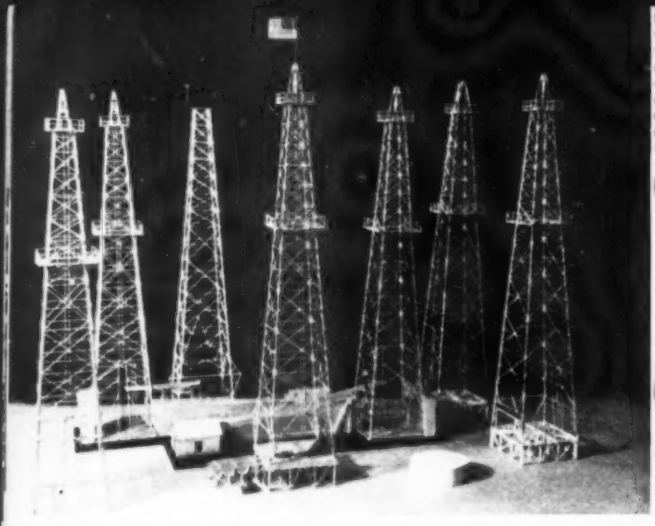
the largest of its kind in this country, depending entirely upon wholesale disposal of the product.

"The business," Mr. Bell said, "as a result of the exceptionally fine product I was able to grow in the darkness of the mine, grew so tremendously that it was no time before I was able to forget entirely the small retail business and concentrate purely on the wholesale side. Today, we average a half-a-ton of mushrooms daily throughout the year."

It wasn't quite as easy as all that at the start, however. The mine, when first opened, proved to have a number of drawbacks which in the first months made the business an exceedingly precarious one. For one thing, raccoons had made a home in the mine after it had been abandoned.

"For a month after I opened the mine and planted the mushrooms," Mr. Bell said, "I found the little plants uprooted and the beds despoiled daily. That wasn't so good for business. At that time I was operating at a loss.

[*Continued on page* 141]



That's A Big Bite!

THE huge scoop shovel below picks up 32 tons of sand with every "bite." The monster is one of those being used by the Bureau of Reclamation in digging the Coachella branch of the All-American Canal, in California.

His Hobby Hit "Pay Dirt"

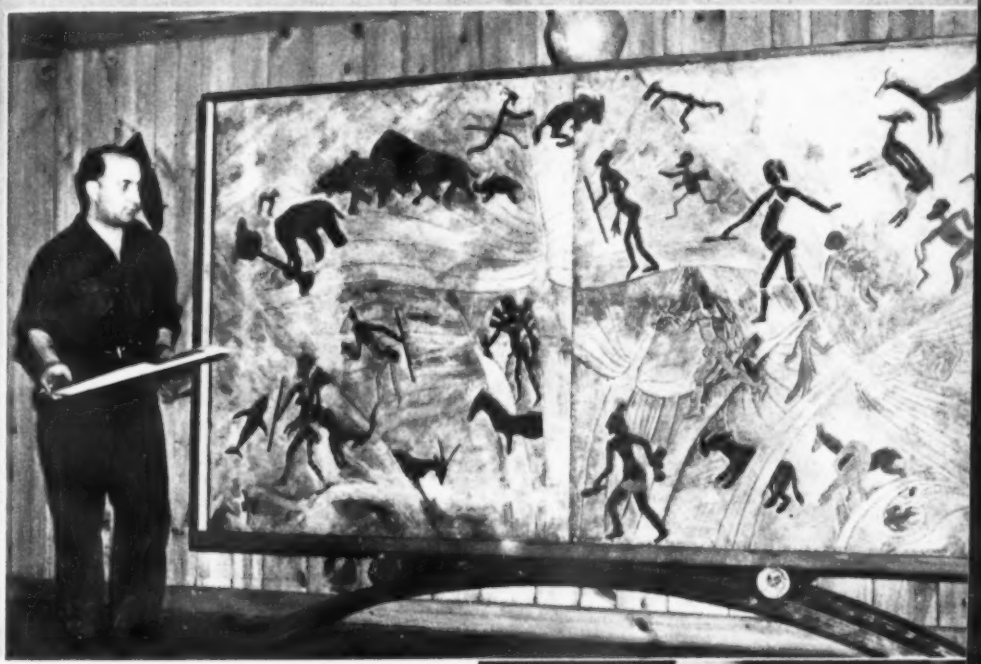
WHEN his usual abundance of commercial art work fell off to practically nothing a few years ago, Henry Kreuger, of Tulsa, Oklahoma, turned to model building. Having a wood working shop, he turned to experimenting with model making. Through this,

[*Continued on page* 126]

New Magnet Has Medical Use

A NEW alnico magnet for the removal of metal fragments from the eyes and surface wounds has recently been introduced. The new instrument is much more powerful and more easily handled than earlier permanent magnets used for the purpose.

Don't Walk On These Walls!



Artist Pierre Bourdelle examines one of the finished "linoleum" murals which he has carved for the new United States liner "America."

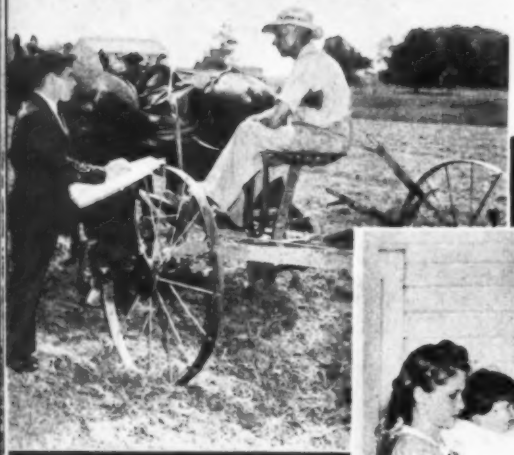
ARTIST PIERRE BOURDELLE has made a specialty of carving murals in that good old kitchen flooring substance, linoleum.

Bourdelle first makes rough sketches on the linoleum, then uses special cutting tools of his own design for carving. After the design has been carved, white lacquer is applied. After this, the linoleum is either colored or covered with gold leaf.

Above: A close-up view of Bourdelle cutting out the design of a lily on the linoleum surface, using a special chisel for the job.

Left: After the figures and designs have been carved out on the surface of the linoleum, they are either colored or covered with gold leaf, as shown in this picture.

Taking The L



Seven million American farmers will each be asked about 135 pertinent questions concerning their crops, livestock, equipment and family under the 1940 Census of Agriculture.

Every member of every family in the country will be enumerated in April, under the Census of Population. Below, the Census enumerator sets down his vital statistics while an interested group looks on.

"HELP! Help!" Startled at this agonized response to his ring, the caller withdrew his finger hurriedly from the bell-push. He listened.

"Help! Help, *please!*" The cry—it was a woman's—seemed not to be coming directly from within the house, but rather from out behind it! Throwing caution to the winds, the visitor grasped his briefcase tightly under one arm, vaulted the porch rail, dashed around toward the source of the voice. Then by the rose arbor leading to the kitchen garden, he stopped short, amazed at what he saw.

No murder was being done, nor was a maniac-at-large brandishing a butcher knife. Neither was a holdup being committed, nor were robbers making a getaway. From the tones of the woman's voice, the rescuer had expected something at least on this order. But the emergency was no less serious.

An attractive housewife was in the yard, hanging out the wash. And just as she had put up the last piece the clothesline had snapped. The ground was wet, muddy; rain had fallen almost the entire week end. And the sweet young thing was exerting her entire strength in holding together the broken ends of the line to keep from having to do her job all over again.

When the rescue had been effected, a new line obtained and the washing transferred, the grateful woman paused to thank the stranger:

"Whew!" said she. "I'm certainly grateful for your help! I was just about to pass out when I heard the bell ring. But—but—who are you, anyway?"

"Madam," came the surprising reply, "I'm

he Long Count!

by
Colin Kerr Cameron

When your Uncle Sam starts to count noses, it's a big job! This year's counting, going under the official title of the Sixteenth Decennial Census of the United States, is going to be the biggest undertaking of its kind the government has ever attempted, consisting of seven different census, each complete and on a nationwide basis!

On the night of April 8, a special effort will be made by Census enumerators to list every member of the nation's roving population. Below: Just a few of the Census Bureau's sorting machines. Altogether, about 2,500,000 pounds of machinery will be required to completely sort and tabulate the tremendous mass of statistical information which will be gathered. These Census machines, nearly all of which were especially developed and built by Census Bureau engineers expressly for Census tabulations, are "almost human."

the U. S. Census enumerator. And now will you tell me your name, please, and answer the rest of these official questions for the government?"

This incident, all in the day's work for the Census man, happened last year in South Bend, Indiana, during the "trial" Census in which the U. S. Bureau of the Census was experimenting with proposed questions for the big Census of Population which starts throughout the country in April this year.

It could have been far more serious, however. Take, for instance, the adventure of another enumerator in a previous census. Going about his business, house-to-house, in a district where stores and homes were about equally mingled, he heard a series of shouts.

"Stop! Stop! Stop that man, somebody!"

At breakneck speed a hatless man was being pursued down the street toward the Census man. Almost automatically, the enumerator stuck out his foot, tripped the fugitive, who was promptly arrested by the police officer leading the chase. The enumerator then learned that the fleeing man was a criminal wanted in half-a-dozen states for a series of crimes including armed robbery and assault. Rewards had been posted for him, which the enumerator later received and shared with the officer.

Another enumerator had made repeated attempts to interview the "lady of the house" in a certain private residence. On the doorpost, above the bell, was tacked a small sign: "Canvassers and peddlers not welcome."

These women are using electrically operated unit tabulators, which are robots of amazing efficiency. From punched cards passing through at the rate of 400 a minute, they pick out required facts according to their settings, add up dozens of columns of figures at the same time, and keep separate all tabulations and totals on each subject.

The Sixteenth Decennial Census

120,000 *Enumerators*, directed by
528 *District Supervisors*, under management of
105 *Area Managers*, constitute the field army of the 1940 Census, to assemble facts and figures on:

132,000,000 Americans, in the Census of Population;
33,000,000 homes, in the Census of Housing;
7,000,000 farms, in the Census of Agriculture;
3,000,000 businesses, in the Census of Business;
170,000 factories, in the Census of Manufacturers;
400,000 oil and gas wells, and
14,000 coal and metal mines, in the Census of Mines and Quarries.

In Washington, an augmented force of
7,000 *Statisticians* and *Clerks*, under the direction and supervision of the Census Bureau's permanent staff of
700 *Administrative Officers, Technicians, Specialists*, and their *clerical assistants*, using hundreds of high speed tabulating machines, will sum up the facts and figures collected by the field force in useful, informative and basic tables for the Nation.

And judging by his various receptions, the enumerator guessed the sign meant what it said. Repeatedly he had rung the bell, waited until the door was opened, and attempted to introduce himself. But each time the woman had glanced at his formidable portfolio and had taken it for granted that he was just another salesman.

"We hain't buyin' nuthin' at all!" she would declare and slam the door in his face. The enumerator got desperate. He's required by law to carry out his task, just as all citizens are required by law to answer the official questions of the Bureau of the Census. So violently he jabbed the bell again, kept it jabbed, heard it reverberate relentlessly through the house.

The door opened hurriedly.

"Madam!" shouted the enumerator in a compelling voice. "I'm a Federal man—and you close the door at your own risk!"

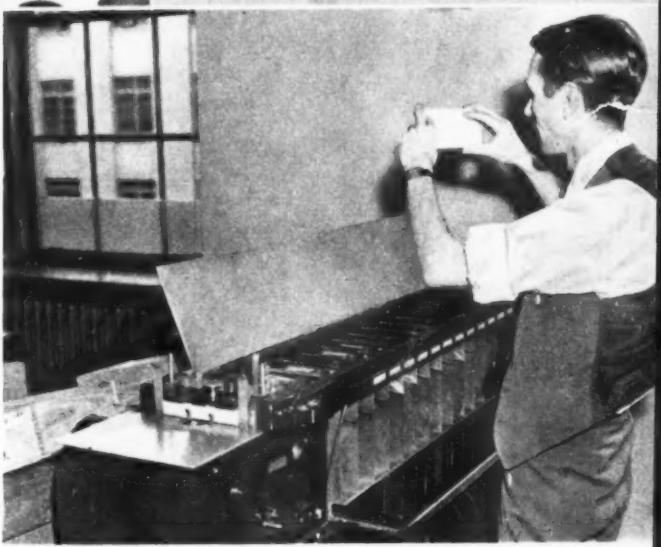
It worked. Even more dramatic, however, was the occasion when an enumerator was working a boarding house in a colored section in a railroad town down South. He had some difficulty in eliciting the required answers from one shifty young chap, but finally left the job as done. At the next house, however, he noted on his sheet one question unanswered, so he went back.

"I want to see James Green again, please."

"Mistuh," replied the buxom Aunt Jemima

Below: The tiny contacts shown here in the unit tabulator can be adjusted to read any desired combination in cards with 45 columns each. When a hole for which they are set passes over, the points complete a circuit wired through each position, causing a counting cam to operate the appropriate tabulating group.

Today's Census punchcard operators transfer coded details from schedule sheets in the manner shown above. The electric-lighted schedule holder allows only one line on the schedule to be seen. The cards are code-punched in accordance with the facts given on the sheet. Below: To separate specific groups of cards for further checking, such as auto mechanics in a given state, the state cards are passed through sorters like this. Electric contacts "feel out" the telltale punch-holes on cards bearing the required information and divert the cards into a special hopper.



who ran the place. "You'll shuah have to travel awful fast to ketch up wid him. He done lit out o' dis place less'n two minutes after yo' lef' heah befo'—an' he ain't even took no belongin's wid he!"

The Census enumerator always gets his man. Sometimes he has to take tremendous chances to do so. In Alaska, for instance, the best time for the Census man to work is winter time, when the weather in some regions absolutely prohibits miners, prospectors, farmers, and the like, from leaving the safety of their small towns or villages. Gathered together for mutual security, the Census man finds and enumerates them when virtually all other activities are at a standstill. In this northern territory, where every Eskimo is of Census interest, the Census men travel by plane, boat where there is open water, dogsled, snowshoe, skis, and on occasion even emulate Santa Claus by riding behind reindeer. They risk their lives to complete their jobs, and actually, following spring breakups in the past the bodies of more than one enumerator have been found, their Census documents protected within their parkas.

Census enumerators in Alaska are usually rather a diversified group. For the current Census, credentials have been issued to missionaries, teachers, nurses, doctors, and others who know the country and the people. One enumerator, Ivan Skarland, is a graduate of

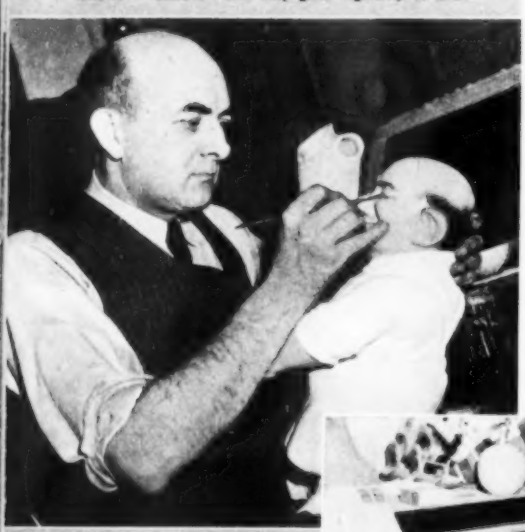
[*Continued on page* 128]

William Zegel lovingly looks over a group of his finished "children" and they gaze roguishly at him.

He Models For His Little Men

WOOD carving was just a hobby with William Zegel, of New York City, until some friends urged him to try to sell some of his finished products a few years ago. Since then, he has become the head of a thriving little business which specializes in the production of roguish little men to be used as advertising trademarks.

Using himself for a model, Zegel carves the little men entirely out of wood, and paints them himself.

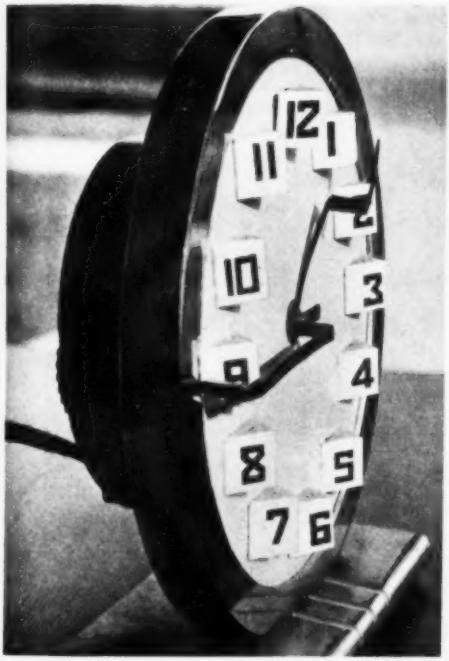


The creator gives life to his tiny men by painting the features of each figure with painstaking care.

When he starts out on a little man, Zegel uses himself for a model, drawing his own features with the help of a mirror.

It's Right From Any Angle

SO FOLKS can tell what time it is from any angle, the late Anthony E. Carlson, Los Angeles inventor, devised this three-dimensional clock. Numbers are painted on the protruding planes of triangles set in the dial face, while the hands are bent at right angles. Simple but ingenious, the invention was recently made public by the inventor's widow.



She Looks A Little Nervous

AND who wouldn't, playing nursemaid to this little animal? The truth is, the skunk has been deodorized, but even at that, the young lady looks as though she could think of better things to do. The girl and her little playmate took part in a recent Los Angeles fashion show, when models escorted live "samples" of the fur coats they wore.

New Eye Machine Accelerates Reading

THIS device, known as a metronoscope, is a new scientific device developed by scientists to train and exercise weak, lazy and inefficient eyes. It aids in training one to read more efficiently and at the same time exercises weak and lazy eye muscles which do not function together as a unit. The machine forces the user to read properly.

Crabbing His Act

Lew Bramer exhibits one of the crabs, or crawfish, which he and his brother snared in Lake Michigan last summer. The brothers averaged 4,000 a week.

TO THE average schoolboy—who regards all teachers as old crabs anyway—it may not come as startling news that one particular teacher has capitalized on his crabbing and made it pay. The gentleman in question is Lew Bramer, small town schoolmaster and athletic coach, of Nahma, up on Big Bay de Noc, in Michigan.

Mr. Bramer's crabbing is of the deep-sea rather than the classroom variety. Having made a comprehensive study of the crab question during his vacation last summer, "Professor" Bramer came up with two significant discoveries. They were (1) that a Wisconsin packer was offering to pay as much as 50 to 70 cents a hundred for live crabs, depending on size, and (2) that the floor of Lake Michigan, in the vicinity of Big Bay de Noc, literally was crawling with finger-pinching crustaceans waiting to be trapped.

As a direct result of these conclusions, Bramer spent a most profitable vacation last year depleting the crab population of Lake Michigan; and he expects this summer to expand his activities in this particular field of endeavor. And, since he was able to ensnare an average of 4,000 crawfish a week last season, to the very good health of his bank book, he can see no reason whatsoever why he shouldn't do infinitely better this year, when experience will be in his corner handling the towel.

It was through the accepted formula of

Above: Lew Bramer lifts one of his crab traps out of 20 feet of water. Right: Pulling in a box of spaced laths used for storing live crabs.

by Ormal I. Sprungman

This is the way the crab walks up the gangplank and enters the funnel-shaped opening. The brothers have taken as many as 42 crabs from a single trap!

If a crab loses a leg, feeler or claw, a new member grows out to take its place. This crab has just begun to "sprout" a new right claw.

A close-up of the Bramer's homemade spaced-lath crab trap. Notice the fish head, used for bait, suspended from the cover about to be placed on the trap.

trial-and-error that Mr. Bramer arrived at the proper type of trap for luring crabs. The latter then stood revealed as a box made of spaced laths, the box being 2 feet long, 8½ inches wide and 8½ inches deep. At each end was a gangplank leading up to a 2-inch opening in the trap, through which the doddering crustacean could waddle toward the bait. A tempting morsel of fish head served adequately in the latter capacity.

In actual operation, the traps are placed 50 feet apart in some 20 feet of water, weighted down with stones and anchored to a buoy. Mr. Crab, who is strolling leisurely along in the watery depths, whiffs the fish head, lumbers up the gangplank and topples into the main arena, leaving the bait hanging on its hook as a personal invitation to Mr. Crab's uncles, brothers, cousins and aunts. These relatives invariably come prowling around and suffer exactly the same fate as their brother crawfish, proving that crabs just never will learn.

The actual work involved in crab trapping was not back-breakingly arduous. Each morning, Mr. Bramer and his younger brother, Roland, made the rounds of the 100 or more traps they had set out in the bay. One would paddle while the other would lift, and an average of a dozen prizes would be removed from each box before it was tossed back for more. (The brothers have taken as many as 42 victims from one trap, however!) This part of the job consumed approximately 3½ hours.

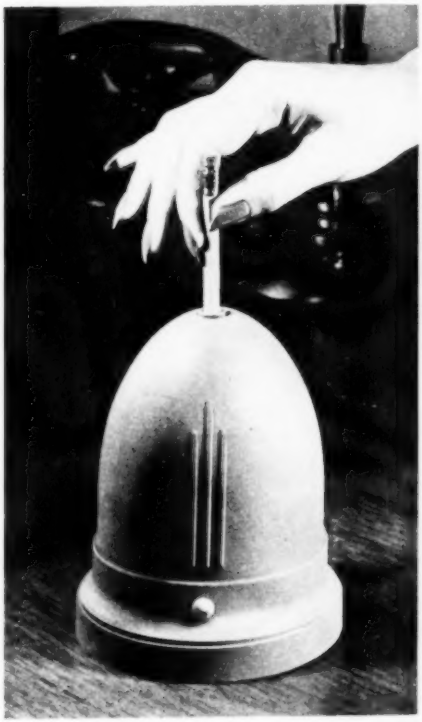
When a trap began to attract less than 6 crabs daily its position was changed and new fishing grounds were found. And, since the huskier members of the crab family bring the best financial return to their trapper, the Bramers frequently found that they could afford to be humanitarian and toss back the weaklings for use as "seed."

Back at their base, the Bramers sorted the catch into large, medium and small and

[*Continued on page* 130]

Life Is Getting Too Easy

ALL the work has been taken out of pencil-sharpening by this new electric sharpener. Insertion of the pencil starts the motor, which shuts off automatically when the pencil is removed.



It's No Fun For The Fish

SPEARING fish underwater with a newly developed rubber spear gun is the latest sport in Florida. The new guns were invented by a Miami University student, Chenault Elmore, who is shown here explaining his invention to a pretty classmate. The gun is rubber slung, and operates much like a sling shot.

Stretcher Carrier Is For Double Duty

FITTED with skis for work on snow as well as wheels for summer use, this stretcher carrier is being trundled by one of the English women who have enlisted for first aid work in Finland. The girl is fitted out with all the accessories for life in the frozen north, including woolen socks, sweaters, and complete skiing equipment.

Folding Boat Is Real Amphibian

The folding boat, in the water, has all the grace of a wooden boat, and can easily accommodate at least five passengers.

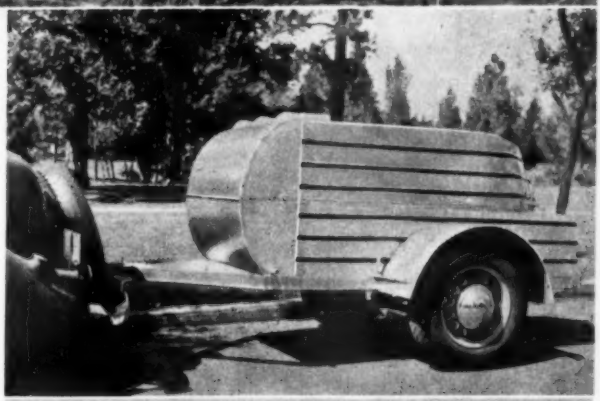
"FOLD it, fish with it, or fall on it" could well be the slogan for this interesting combination trailer bed-boat developed by Oscar Olson, of Portland, Oregon.

When folded up, the boat is a shiny, streamlined trailer, seven feet overall. Unfolded, it's a 13-foot boat weighing 180 pounds, with a 42-inch beam and a 17-inch draft. The sturdy vessel has a wooden floor and accommodates five persons easily.

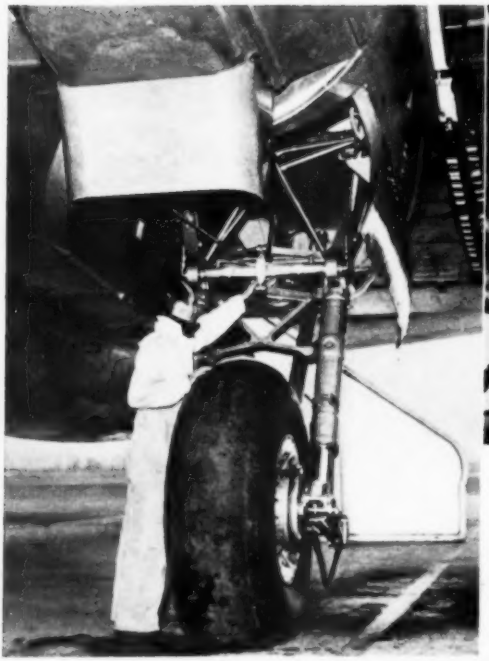
The hinges can be unhooked, and presto!—you've got two boats, ideal for duck hunting and similar purposes. Being all-metal, submerged rocks and logs mean nothing more to the craft than a dent which may be hammered out easily.

And then there's the bed. Once the boat has been removed from the trailer, the oval trunk at the front end reveals a rolled-up steel spring. Just roll this out and you have a comfortable bed!

It looks like a great idea for hunters and fishermen.



Above: With tarpaulin removed, the trailer bed-boat is a shiny, streamlined vehicle of steel, promising a lifetime's service. Below: The boat, half unfolded, revealing its wooden floor.

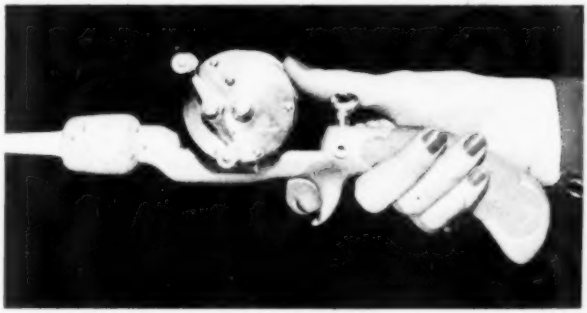


Latest Thing In Transports

AT the left a workman is shown making an adjustment in the retractable landing gear of the giant Curtiss-Wright substratosphere plane. Above are the slotted wing flaps which will reduce landing speed and increase buoyancy 40 per cent.

Pistol Grip Rod Will Please Anglers

THE new pistol grip fishing rod at the right is designed for use with either the right or left hand. The left-handed reel will enable right-handed fishermen to cast and reel in their line without changing the rod from one hand to the other.



Fire Fighter For Planes Perfected

ENGINEERS of the Civil Aeronautics Authority have perfected a device to fight one of the most dreaded perils of aviation—engine fires. The device was demonstrated recently in Washington. A pilot can ascertain immediately when a fire has broken out in an engine compartment, and can extinguish it in a few seconds without leaving the plane's controls.

You're RIGHT—That's WRONG!

Here are 25 statements, some of them true, the others false. The trick is to separate the *true* statements from the *false* ones—and it isn't as easy as it looks! Use a pen or pencil and check the correct box under each statement and see how you make out! After you've given yourself the test, try it out on friends and other members of the family and compare scores. They'll enjoy it and so will you.

Are you ready? Let's go!

1. If the highest mountain in the world were placed at the deepest part of the ocean, the mountain top would show above the water.
   True ☐ False ☐

2. A bittern is a North American plant with a bitter but edible, root.
   True ☐ False ☐

3. A paleontologist is a person who makes a study of fossils.
   True ☐ False ☐

4. Great Salt Lake, in Utah, is noted for the number and variety of fish found there.
   True ☐ False ☐

5. The smallest of all known mammals is the shrew.
   True ☐ False ☐

6. Speech, tools and fire are the three basic inventions by which man raised himself above the animals.
   True ☐ False ☐

7. A spinnaker is a type of loom used in making blankets.
   True ☐ False ☐

8. A catamaran is a jungle wildcat found in certain sections of South America.
   True ☐ False ☐

9. The United States Coast Guard is under the jurisdiction of the Treasury Department.
   True ☐ False ☐

10. Only one of the presidents of the United States was born west of the Mississippi River.
    True ☐ False ☐

11. A Diesel engine uses a fuel injector instead of a carburetor.
    True ☐ False ☐

12. In railroad slang, "the highball" is a water stop for the engine.
    True ☐ False ☐

13. Snakes are not native to New Zealand, Hawaii or Iceland.
    True ☐ False ☐

14. Mozda was the inventor and discoverer of the alternating current principle.
    True ☐ False ☐

15. There is only one moon in our solar system.
    True ☐ False ☐

16. A rotary engine is one in which the cylinders revolve around the crankshaft.
    True ☐ False ☐

17. The indentations, or "dimples," on a golf ball are there to make the ball soar straight.
    True ☐ False ☐

18. International law originally extended a country's sovereignty just three miles out to sea because the cannon of that time could shoot no further.
    True ☐ False ☐

19. A starling is a small star.
    True ☐ False ☐

20. The Simplon Tunnel, in Switzerland, is the longest railroad tunnel in the world.
    True ☐ False ☐

21. A radiologist is a person whose business it is to repair radios.
    True ☐ False ☐

22. In art, the primary colors are purple, green and orange.
    True ☐ False ☐

23. Mercury is the planet nearest the sun in our solar system.
    True ☐ False ☐

24. A horsepower is equal to 550 foot-pounds of work per second.
    True ☐ False ☐

25. A cyclotron is a six-day bicycle race.
    True ☐ False ☐

WHAT'S YOUR SCORE?

To get your score, simply give yourself 4 points for every question you answer correctly and total the result. If your mark is above 90, you are exceptional; if it is between 80 and 90, you deserve high praise; if it's between 70 and 80, you're good; between 60 and 70, fair; and below 60—well, try again next month!

Answers will be found on page 120.

Cross-Examining Minerals Is His Hobby

George Carson clamps a piece of stone on the traveling carriage of his automatic, diamond-wheel saw, which he designed himself.

Carson is doing the preliminary polishing on a felt wheel charged with tripoli powder. Final polishing is done on the other wheel, in the background.

Here is the mineral-collecting lawyer in his specimen room, examining a particularly fine section of polishing Brazilian agate.

FINDING relaxation from cross-examining witnesses by making cross-sections of rare minerals is the hobby of George Carson, head of an Akron, Ohio law firm. As a sort of collusion, he designs special machinery for sawing rocks and fossils in two, and polishing the cut surfaces to a glass-like finish.

Carson's hobby is largely premeditated, for he has been a collector of rare stones and other mineral specimens since he was a boy. About six years ago he decided to try his hand at cutting and polishing agate and other minerals to bring out their hidden beauty. Now he has a basement room fitted out as a mineral museum, with rows of shelves crowded with sections of jewel-like specimens including beautiful Brazilian agate, moss agate, petrified wood from Western United States, a rare section of a petrified dinosaur bone, petrified oyster shells, tigerite, geyserite, amethyst, Labradorite—in fact, examples of practically every unusual mineral it is possible for him to obtain.

And, strewn on tables, shelves and boxes throughout the rest of the cellar, he has additional hundreds of pounds of other

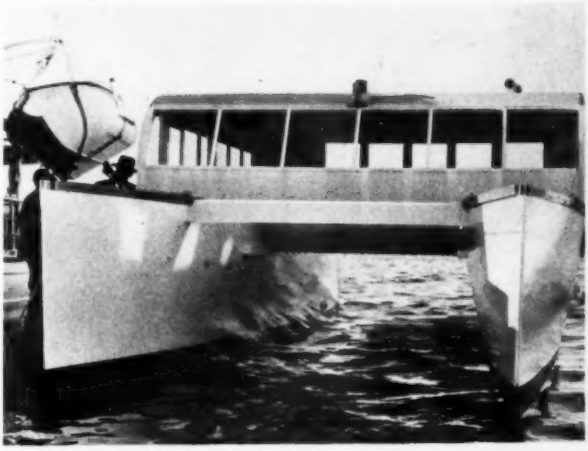
[*Continued on page* 118]

That's What Too Much Study Does!

SEEMINGLY quite interested in the book he's looking at, this skeleton is serving as a model for Florence Eckman, at the Philadelphia Academy of Fine Arts. Sketching the skeleton is the first step of putting realism into the study of art. The student progresses in stages through nudes and finally to fully clothed models. Personally, we'd as soon leave the skeleton in the closet and devote ourselves to pictures of birds, bees, or pretty girls.

One Needle Won't Float, But Two Will

A NEW type cruiser, constructed by Earl McClary, California flyer and yachtsman, is shown here shortly after her recent launching at Long Beach, California. McClary spent several years designing his catamaran cruiser, which runs with almost no bow wave and little wake, and is expected to be stable in rough weather. Each of the two hulls on the unusual boat carries a 100 h.p. engine.



The Hawk Hatches Hard-Boiled Eggs

THIS North American Training plane, shown on the cover, is of the type used by the Army to give advanced instruction in the manly art of aerial combat. This machine is one of the many recently put into service at the flying schools of the Army. These two advanced students have decided that fresh air is as good in the air as elsewhere—the sliding cockpit covers are easily opened for ventilation. Open or closed, visibility is excellent.

your job! AVIATION MECHANIC

by Donald G. Cooley

An aviation mechanic may be anything from a "grease monkey" to a shop supervisor. His job may consist of doing major overhauls, checking instruments or servicing large transport planes during brief stops at airports.—American Airline photo.

"THERE simply aren't enough skilled aviation mechanics in America to go around." That statement was made recently by Louis Johnson, Assistant Secretary of War.

It seems like a strange statement to make at a time when the employment problem still looms large on the national horizon. But it's true. Airplane factories are working overtime, unable to keep up with orders, and jobs are going begging for lack of men to fill them. Some of the statistics are startling.

For instance, at the beginning of this year, 15 leading airplane manufacturers had $648,000,000 worth of unfilled orders on their books. Forty-four cents of every dollar of that money will go for labor when those planes are built. How would you like to have some of that money? It's yours—if you can qualify as an aviation mechanic.

So specialized a field is aviation mechanics that a number of companies have taken steps to train their own men. The Lockheed Aircraft Corporation has 2,000 of its workmen taking part time courses in Burbank High School, California, and expects to have 3,000. It has 100 apprentices enrolled in its shop. Other companies are taking similar measures.

The war is the primary cause of the airplane boom which may or may not continue at its present level. You will naturally give thought to all these facts when considering aviation mechanics as a career, for your training will be a long-term investment. Present opportunities are outstanding, future possibilities excellent. If you are made of the stuff that goes into a good aviation mechanic, you are fortunate above most men whose vocational leanings are hazy and ill-defined.

How can you tell if you could make good? In a general way you can take your measure with the aid of the aptitude test on page 71. The test is a guidepost, not a guarantee, for success can't be measured like a mathematics problem. Related tests which you will find

Do you have the temperament required of a first class aviation mechanic? Try the aptitude test on page 71 for your answer to this question. The article, fifth in a series on "Your Job," appearing monthly in MECHANIX ILLUSTRATED, tells what is required of an aviation mechanic.

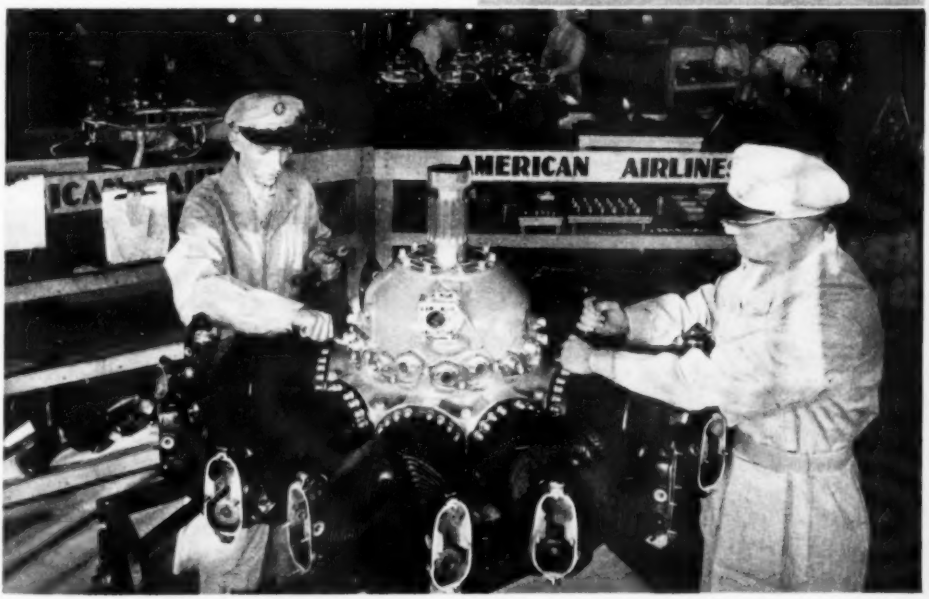
helpful are those for auto mechanics, in MECHANIX ILLUSTRATED for January, and for airplane pilots in the April number.

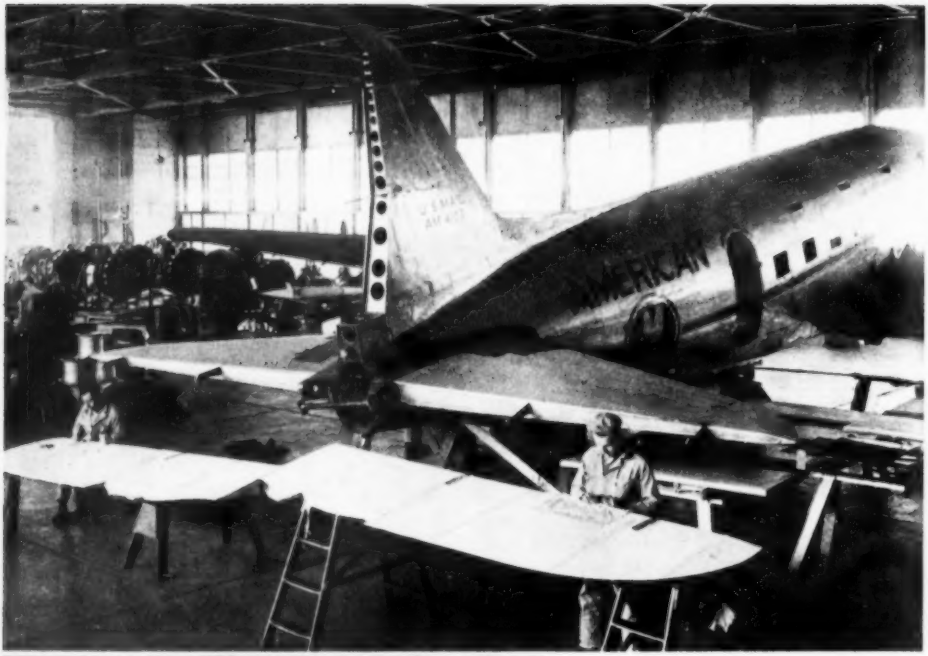
As far as the government is concerned, there are only two types of mechanics: Aircraft Mechanic and Aircraft Engine Mechanic. Licenses are issued for both ratings and you will absolutely require these licenses to get far in the field. You must be at least 18 years of age, of good character and able to speak and write English. For Aircraft rating, you have to know how to inspect, maintain, repair, and overhaul aircraft, and possess theoretical as well as practical knowledge of structure and rigging, demonstrated by an oral and written test. And—here's the rub—one year's practical experience is required.

For Aircraft Engine rating, you will have to pass tests similar to the above, on power plants, and will also need one year's experience. [*Turn to next page, please*]

Above: Accuracy is an absolute essential in the work of an airline mechanic. Carelessness in the machine shop may result in heavy loss of life and loss of plane.

Below: Two master mechanics reassemble a 1,100 h.p. Wright Cyclone engine after a complete overhaul. The engine is tested before installation in an airliner.





Above: There's more to the job of being an airline mechanic than just repairing engines. You have to know something about wing and fuselage assembly, too. Below: Mechanics are shown replacing a tire on a transport landing gear. Special skill is required.

With these licenses (one or both) in your possession, plenty of doors will swing open to you. They are issued by the same authority that licenses airline pilots, and carry the same weight in their field. By the time you get your rating you will have expended a lot of brain sweat and wiped a hogshead of grease from your fingers.

Let's skip those details for the moment and imagine that you have your licenses. There are now two possibilities open to you. Either you go to work for an airline company, or you get a job in an aircraft or engine factory. The airline job first? Okay—contact!

Your company has a base—one of the cities along its route—where all overhauling and major mechanical jobs are done. That's where you work because you aren't yet an all-around man capable of taking care of all sorts of emergency jobs that confront mechanics at other stop-over points along the line. The base city is several hundred miles removed from your home town, but you realized when you tackled this

Test Your Qualifications for the Vocation of
AIRPLANE MECHANIC

These 25 questions are designed to help you decide for yourself (no one else can) whether or not you would be well-suited to the aviation mechanic's trade. Naturally a brief test cannot supply a definite, positive answer, but if you score less than 80 (crediting yourself with 4 points for every "yes" answer; "no" answers do not count) you would probably do well to examine the possibilities of a different vocation. Any score above 80 indicates satisfactory aptitude.

	YES	NO
Would you rather work with your hands than have a white-collar job?		
Are you willing to put in a year or two of greasy, dirty work at small pay while getting experience?		
Would this occupation satisfy you and lead toward the life goal you have in mind?		
Are you systematic in your working habits, keeping your room, desk and personal belongings neat and orderly?		
Is your health good; are you strong enough physically to work on your feet all day?		
In your spare time, do your activities and hobbies have a definite aviation or mechanical slant?		
Have you examined many airplanes at close range, been around at airports, been curious as to what "makes them tick?"		
Are you at home with tools, making things with your hands, repairing your car, furnace, electric toaster, having a home workshop?		
Are you a good enough student to acquire theoretical as well as practical knowledge (why an airplane flies, drag, lift, etc.)?		
Have you ever built model airplanes or gliders?		
Have you finished at least two years of high school or equivalent?		
Do you stand well in algebra, geometry, trigonometry, chemistry, physics, mechanical drawing, machine shop?		
Are you a "bear for detail," a fanatic on accuracy, a stickler for perfection?		
Do you like to devise small inventions and improvements on things?		
Are you a sticker, even when a job to be completed is tedious and distasteful?		
Do you follow aviation developments in magazines, trade journals and newspapers?		
Are you hard to discourage, don't give up easily?		
Do you recognize most of the airplanes you see in pictures, identifying the names of the manufacturers with major types?		
Do you know what these terms refer to in aircraft and engines: gyro pilot, longeron, stabilizer, tachometer, nacelle, variable pitch, camshaft, cowling, lateral stability?		
Do you work under your own steam, following through on a given job from start to finish?		
Are you willing to invest four years of your time before reaching well-paid wage levels justified by your experience?		
Can you work well under high pressure conditions?		
Do you get along well with people (important in getting a job, working with fellow mechanics)?		
Are you able to go to larger cities where airline, factory and training opportunities are concentrated?		
Do you feel that you can hold your own in a technical field where intelligence of a high order is not only an asset but a requisite?		

game that an aviation mechanic's work is concentrated in large centers of population.

You seem to have all the dirty work handed to you at first and you begin to understand where that term "grease monkey" came from. Engines in for a general overhaul are taken completely apart and you have hundreds of small parts to wash and clean until you wonder if you signed up as laundry maid to an airplane engine. Well, when you're a master mechanic you won't want to do your own grease monkeying, will you? It's like a fraternity initiation. You're being watched. If you can give the impression that you take a bath in cylinder oil every Saturday night, you've made the first grade. Don't look surprised when you discover your job is dirty. In this game the winning slogan is "The oily bird gets the worm." The lily-white one gets the hook.

Under the watchful eye of master mechanics, you begin to get a taste of more important work. After every flight, the pilot reports on the functioning of 30 or 40 different elements of his ship, and those which are faulty must be inspected and repaired or replaced. There are half a hundred items that you learn to check as a matter of routine—feed lines, ignition, strainers, fuses, tanks, controls, rocker arms, greasing and oiling.

Here's where your passion for thoroughness, for carrying through on a thousand small details, gives you a plus rating. Absolute accuracy is a religion with you. A feedline repair just good enough to get by would never satisfy you—if it gave way and the ship crashed you'd be haunted the rest of your life. You'd walk a mile for a lock nut if that's what the job requires.

Your superiors learn that about you—

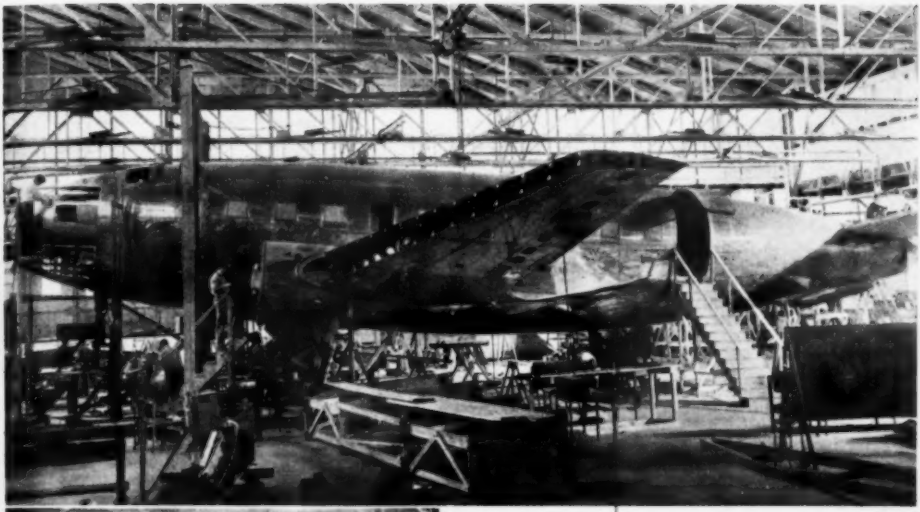
Above: The heart of an airliner is the instrument panel in the pilot's control room. Servicing these sensitive instruments is a major job in the American Airline maintenance shop.

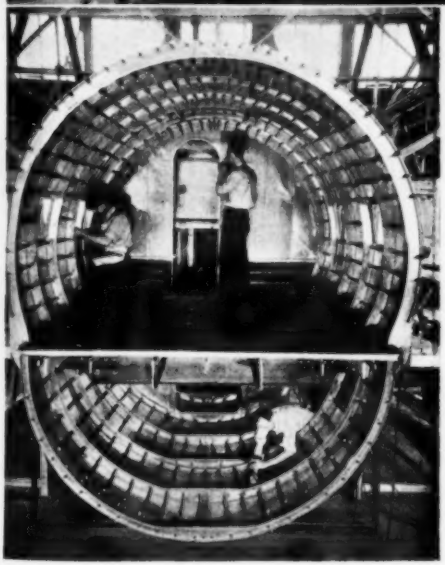
Right: Propeller repair and assembly is an equally delicate job. Every mechanic must go through a period of apprenticeship before being permitted to work on such vital plane equipment.

there's no hiding it—and you make steady progress through the grades of junior mechanic to senior to master. In the base shop you have been doing all kinds of jobs and perhaps have become a specialist in some division. You may go in for special training on rigging or control wires. Or you may have unusual dexterity in working with your fingers with small parts, so instrument work appeals to you. Plates must frequently be replaced on metal ships and you start learning about riveting and alloys at first hand. An airplane contains miles of tubing that call for expert care in repair and installation. Or you have a flair for fine precision work involved in propeller maintenance and engine part replacements.

Welding, metal working, heat treating, pattern making, assembling, machine operating, tool designing—all of these departments are vital in the operation of your base. An airline base is essentially a small factory and the operations just listed come under the manufacturing department head. Maintenance of planes and engines is usually a separate division.

For every man flying a plane there are five or more on the ground who keep it in the air. The airlines employ around 3,000 mechanics. This is a small, select group—the cream of the crop. Competition for jobs is tougher here than in other fields. High intelligence and thorough training with that indispensable quality of personality that we have called a passion for absolute accuracy, help to give you the edge on competition.





Above: Factory assembly is another phase of shop work requiring mechanics with special training. This is a Curtiss-Wright Substratosphere transport being assembled. Left: Fuselage section of the huge transport plane being assembled.

There are also, of course, air companies carrying no passengers, running commercial lines, which need capable mechanics at their hangars. Qualifications are very similar to those of airline mechanics, except that many of these smaller organizations farm out their major jobs. It is difficult to analyze the opportunities with such companies for the reason that their methods of operation are not standardized as are those of the airlines.

"Only 3,000 mechanics employed by the airlines and most of those jobs filled—wouldn't I stand a better chance in a factory?" you are asking.

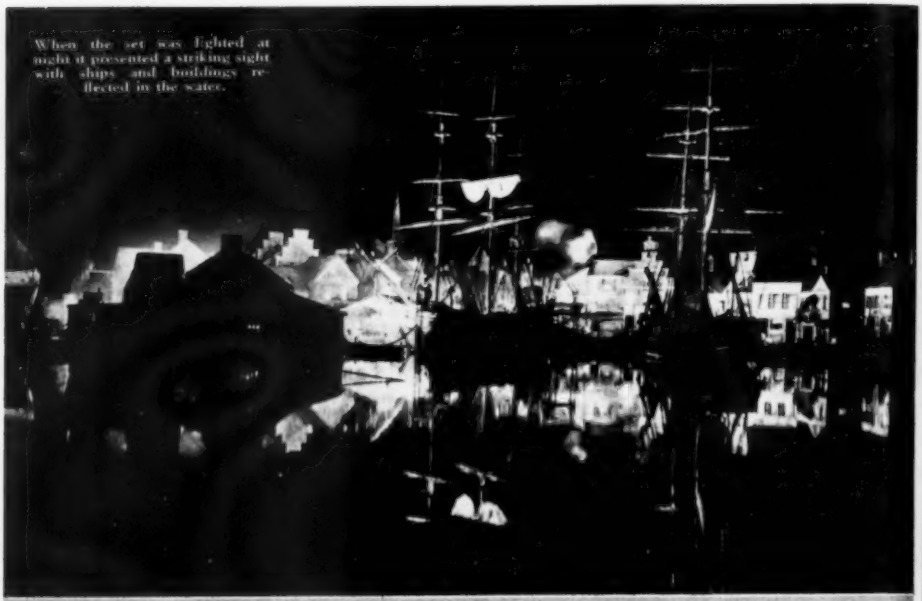
Very likely you would. So, still imagining that you have your government rating, we'll take you to one of those humming factories, that is crying for skilled mechanics, and get you a job.

Right now the most pressing shortage of skilled men reported by aircraft manufacturers is for specialists in steel work and welding, assembly and installation mechanics, and machine operators.

As an assembly mechanic you will help to put the vital parts of an airplane together. In larger plants, airplanes are now manufactured along lines adapted from the auto industry. Your job may be to install engine mounts and you may never see the completely assembled plane unless you walk over to some far end of the plant where it comes off the line.

There is plenty of variety to the work inside an airplane factory, but at most you will probably work at only two or three jobs before you find your special niche. On most of them you will have to read blueprints and, doing much the same type of work you would in an airline base, meet the same high qualifications. In this article we are not discussing aviation engineering. Engineering positions require specialized engineering training which is available through private schools and colleges. If you would not be happy as a

[*Continued on page* 116]



When the set was lighted at night it presented a striking sight with ships and buildings reflected in the water.

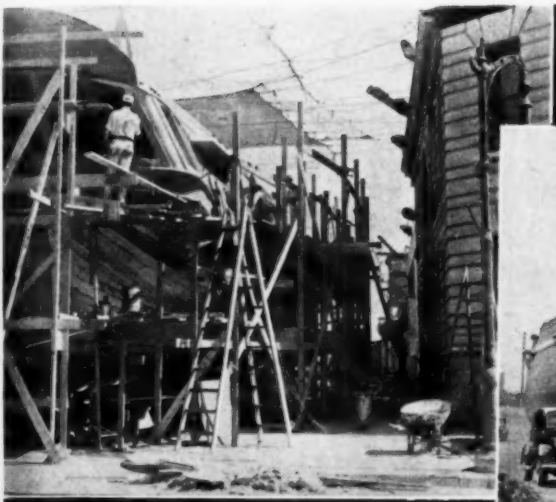
Ships That Never

ONE of the oddest sights in Hollywood's history was the construction of a large wooden ship on a prop city street on the 20th Century-Fox lot. Movie shipbuilders worked for weeks building it. The deck of the old-time vessel was level with the roofs of two story buildings. A huge cloth screen was stretched across the studio street, above the boat, to protect workers from the sun.

When the ship was completed, a house moving company was hired to haul it into a dry lake, which was recently dug in a golf course next to the studio. The lake is on a hill, about 75 feet above the level of most of Los Angeles. In the dry lake bed it was fitted out with three masts to resemble a barkentine of 1807.

Another old schooner was also completely built on the lake bed before the lake was pumped full of water. Ancient houses were constructed along the waterfront to resemble "Little Old New

The world's first steamboat, the *Clermont*, duplicated in every detail for the motion picture, runs into trouble on her maiden voyage. The scene is based on a historical incident in 1807, when the real *Clermont* took its first test run.



Workmen are shown here building the hull of an ancient schooner in the middle of one of the studio's prop city streets. A cloth screen was placed over the ship.

A house moving company was hired to move the big ship to the studio lake. Notice how small the auto appears next to the ship.

Go Down To Sea!

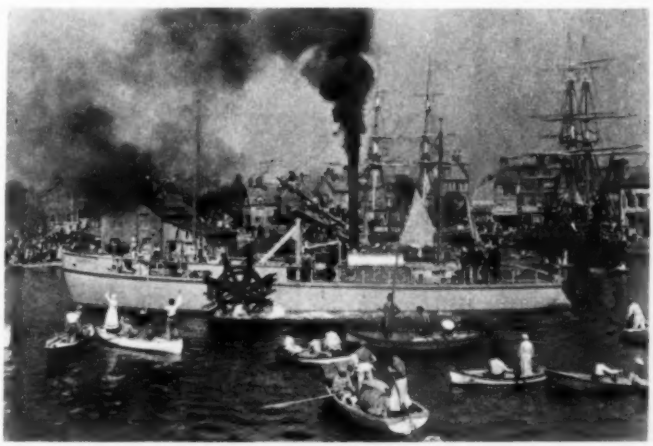
York," which is also the title of the film.

The film deals with the construction of the world's first steamboat, the *Clermont*. Ship carpenters and players, all dressed as early shipbuilders, constructed the duplicate of the *Clermont*. It was launched in the lake, which is supposed to be the Hudson River. To film the picture the cameramen used a big raft to carry their lights and cameras about the lake.

The biggest thrill of the filming was when the *Clermont* was sent across the lake, under its own steam, to ram into a boat shed, just as the first *Clermont* did on its maiden voyage.

When the set was lighted at night it presented a striking sight with the masts of the schooners and waterfront buildings reflecting in the murky water.

Hollywood prop men are called upon to do many odd things in the making of motion pictures, but probably nothing stranger than this, the construction of seaworthy ships that will never go down to sea!



Under its own power, the *Clermont* steams across the man-made lake. At the right can be seen the three masted schooner that was constructed on the studio street.

"Snow Whites" To The Rescue

YES, that's what they call these asbestos-clad firemen at the U. S. Naval Reserve Air base, at Floyd Bennett Field, New York. The miniature motorcycle "fire wagon" is equipped with four chemical extinguisher tanks, fifty feet of hose, and compartments to contain the asbestos fire suits.

New Belt Teaches Swimming

HELEN FELTON, of Miami, is wearing a new life belt made of aluminum and fastened to the waist by rubber bands which suspend the body at the proper depth for swimming. The belt, recently introduced, enables novices to learn the crawl, breast, side and other strokes.

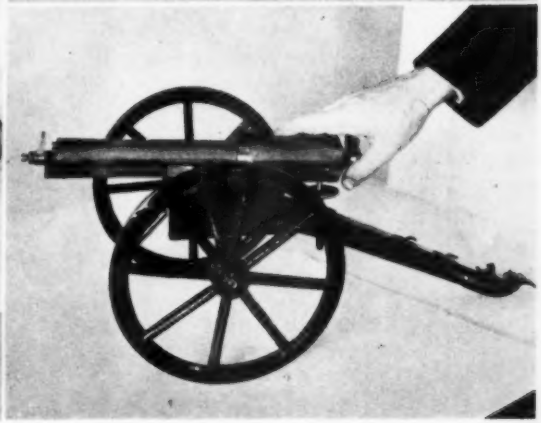
150th Birthday Brings Memories To Patent Office

THE month of April celebrates the 150th birthday of the United States Patent Office. The anniversary, celebrating a century and a half of American inventive genius and ingenuity, brings to light some of the models reposing on the 50 miles of shelf space in the Patent Office at Washington.

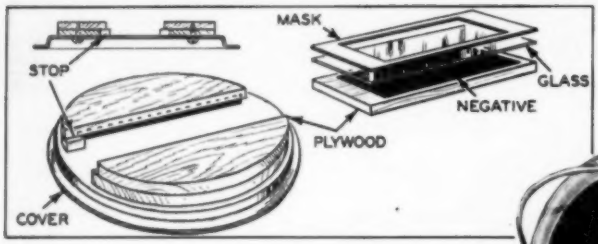
Some of them are odd, many of them are humorously impracticable, others are ludicrous in the light of present day achievements—but a great percentage of the models on the shelves show the American ingenuity and perseverance that is the foundation of our present world of wonders in fields of mechanics and industry.

One of the oldtimers on the 50 miles of shelf space at the Patent Office in Washington is this model steam engine, invented by Ross Winans, and patented by him back in 1837. Below: This gun was patented by Richard J. Gatling on May 9, 1865, and was the first of the famous line of Gatling guns. The Patent Office is sometimes called the world's largest ten-cent store, because it sells so many copies of patents at ten cents each.

This is a lifeboat, believe it or not! George Judson, who secured the patent on it, thought that people could be persuaded to sit inside the barrel.

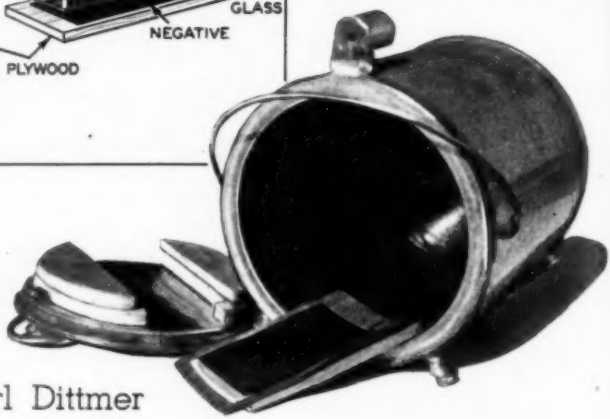


Build This Pin Hole C



Above: Details of the back of the tin can camera. Two wood panels are screwed to the lid with the upper panel projecting over the bottom one. The film carrier holder slides between the panels. See photograph of camera back shown at right.

Above right: Showing the pin hole camera all set up for a field day. Note finder and tape over lens opening. Above: Showing film holder inserted in lid of can.



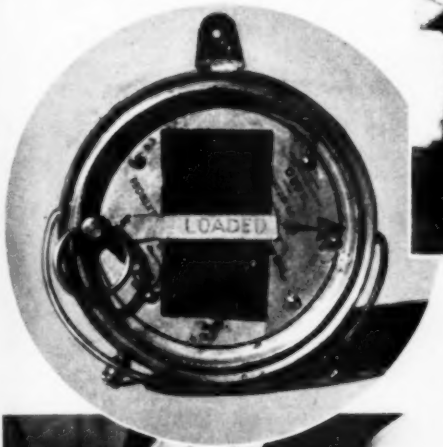
by Henry and Karl Dittmer

A HOME-MADE camera, possessing an aperture of one-hundredth-of-an-inch, can be made from a syrup can at practically no expense. Several pieces of wood, a piece of glass and a few screws are all that are needed.

The main part of the entire unit is the lid which holds the film. The drawing and photos show how it is used. Two panels of wood are cut with a coping or scroll saw to conform to the curvature of the can's lid. These are screwed to the lid with the upper panels projecting over the lower ones, thus forming a groove for the film carrier to slide into. The bottom panels are notched at one end to act as a stop for the film carrier.

The carrier itself consists of a block of wood, slightly less than the thickness of the bottom panel, that serves to hold the negative carrier. Film is placed on the carrier, with a mask if desired, with a sheet of glass to hold the film flat and in place. The entire negative carrying unit is then slipped into place in the

Camera



Above left: Showing back view of camera with viewfinder at top. The metal ring is simply used to remove the lid from the tin can. Above right: This picture was taken with the tin can pin hole camera. Left: Showing the front, or business end of the camera. The tiny pin hole is covered with a strip of black tape. Right: Pin hole camera picture.

lid of the can. Loading is done in a darkroom, of course, and only one exposure can be made at a time.

The front of the can has nothing more than a tiny pin hole, preferably made with a steel needle. When loaded, this aperture is covered with a strip of black tape which is removed during the exposure and replaced when the exposure is complete.

The tin can, pin hole camera is supported by two radio binding posts located on the bottom and towards the rear of the can. The front is supported by a small machine screw which permits adjusting for elevation.

The camera is aimed with the aid of a rifle-like finder which consists of a small hole in a piece of ½-in. tubing soldered to the top of the can at the rear edge. The tube is closed to a small opening at the rear end of the sight. Pictures were taken with exposures of five to ten seconds.

Shutter Speeds To Stop Motion

A study of the chart below suggests what shutter speeds are required to stop subjects in motion at various angles to the camera.

SUBJECTS IN MOTION	Approximate Speed of Subject in Miles per Hour	Distance of Subject from Camera	PROPER SHUTTER SPEEDS: Motion Toward or Away from Camera	Motion Right Angles to Camera
Landscapes Including Slowly Moving Water		Beyond 25 Feet	1/50 to	1/100
Pedestrians, Slow-moving Animals		25 ft.	1/100	1/250
Construction Work, Street Traffic	5 - 10	50 ft.	1/50	1/200
Boating, Children Playing		100 ft.	1/25	1/100
Athletics, Baseball, Yacht Races		25 ft.	1/200	1/500
Horse Racing, Motor Boats	20 - 30	50 ft.	1/100	1/250
Surf, Diving, Views from Trains		100 ft.	1/50	1/100
Auto Races, Motorcycles		25 ft.	1/500	
	60	50 ft.	1/200	1/
Airplanes, Fast Trains		100 ft.	1/100	

How to Build SECTION

For Dogs Only! Bungalows to please every Fido's fancy and every dog owner's backyard. Turn to page 84 for plans and suggestions.

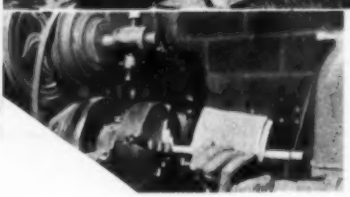
IN THIS ISSUE

Pictured here are a few of the things described in the following pages. These projects are selected for their utility, variety of interest and ease of construction.

"Mighty Mite," only half the size of receiver on which it rests above is simple, powerful short-wave transmitter. Page 90.

Cordova Coffee Table. Sturdy construction, beautiful design, suitable for inside and outside use. Page 107.

Flagpole For The Beach Cottage. Easy to make and will be an improvement to the property. See page 106.



The Modern Farm Shop. Useful suggestions for bringing the farm shop up to date. Plans for installing a shop in suitable farm buildings start on page 96.

HURRICANE LANTERN FOR THE PORCH

Simple hand tools and soldering iron will build this beautiful, weatherproof lantern.

by Ralph T. Moore

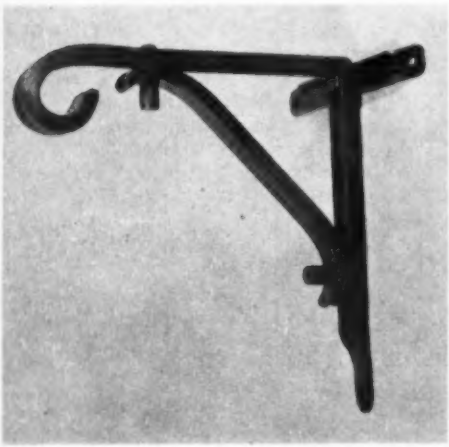
FEW things will enhance the appearance of a house more than this bronzed lantern, or offer the home craftsman a more interesting project. The construction presents no unusual problems or difficult details, and the finished lantern is well worth the effort put into it. Placed on the wall near the front door it becomes most useful and attractive, and, due to its durability will withstand the onslaught of the weather.

Make the conical top of the lantern first. Draw a pattern on paper (see Fig. 1), transfer it to a piece of 26-gauge black or galvanized iron and cut out. Drill three pairs of matching holes as shown and rivet the piece together to form a cone. At a hardware store purchase a glass shade for an ordinary lantern. These shades may be universally obtained for less than fifty cents. It is used in this lantern in an inverted position, that is, with the large part up. Cut two strips of galvanized iron 1-inch wide and form two rings by soldering. These rings are to fit outside of the flanged seat at each end of the glass shade. Drill several ¼-inch ventilation holes in the larger ring and solder this ring inside the conical top as shown. Next solder the cap of an ordinary electric socket to the inside of the top. From a hardware store secure about 8 feet of ¾x⅜x⅛-inch channel iron. Bend a piece of this channel iron into a circle, flat side in, and with a 4¼-inch inside diameter. Now bend another circle similar to the first, but 5½ inches in diameter. The bending is very

Parts for the lantern are easily obtained and assembled. It should be well bronzed inside and out to prevent rusting.

The glass is of the type used in an ordinary kerosene lantern, and carried by most hardware stores.

Sheet metal forms the conical top, to which the light socket is soldered on the inside. The ring is cut from pipe.

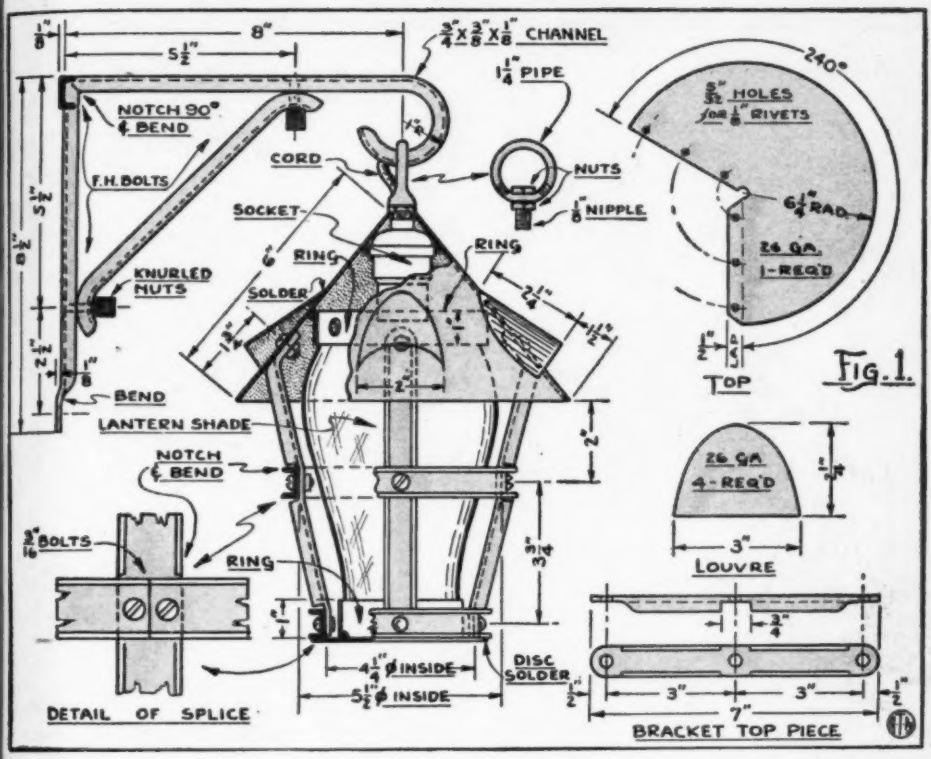


Channel iron bent cold as shown above makes a very strong and good-looking bracket. Finished lantern is at right.

simple and is easily done in an ordinary vise. Heating is neither necessary nor desirable. Drill both of these for splicing, as shown in Fig. 1, and then drill at 90 degree points four equally spaced holes.

Cut a disc of 26-gauge galvanized iron 4½ inches in diameter and to it solder the smaller of the two galvanized rings previously made. Disc and ring are then soldered to the 4¼-inch channel iron circle. The assembly thus formed becomes the bottom of the lamp. On the conical top lay out four $\frac{3}{16}$-inch holes beginning at the lap area, 90 degrees apart and 1¾ inches from the lower edge. Next place the glass shade on the bottom unit and the cone-shaped top on the shade. You now begin to get a rough idea of how the finished lamp will look.

From the remaining channel stock cut four pieces for the vertical frame members and notch the flanges of these pieces to receive the circular iron bands. The method of doing this is clearly explained in the drawing, Fig. 1. Bend the four pieces carefully, as shown, and drill the upper ends to match the holes in the



top. The centers and lower ends are also drilled so they may be fastened to the iron bands. This is accomplished with $\frac{3}{16}$-inch stove bolts ½-inch long.

The four louvres for the top come next and are cut approximately as in Fig. 1. They can, of course, be varied to suit the individual, but should be kept simple. Solder these neatly to the top, spacing 90 degrees apart. The louvres must not entirely cover the bolt holding the top to the frame, otherwise it will be impossible to remove top when it becomes necessary to change bulbs. Allow at least half of each bolt to show beneath top curve of louvre, so a screwdriver may be employed.

Cut a ring from a piece of 1¼-inch pipe ¾-inches wide and drill to receive a ⅛-inch pipe nipple. Saw the excess metal away from the hole and file the edges round. Two pipe nuts hold the nipple in place and the nipple in turn is tightened into the socket cap.

Three pieces are required for the support bracket. The long piece is notched at the flanges and bent at right angles. The bottom of the hook bend is drilled to allow the electric cord to pass through, and this hole should be dressed with a rat-tail file. Flat head ¼-inch bolts are used to fasten the bracket sections, and the holes countersunk accordingly. Knurled or cap nuts present the most attractive appearance. Screw a bulb in the socket and then assemble the whole lantern. Hook the ring over the bracket hook before feeding through the cord.

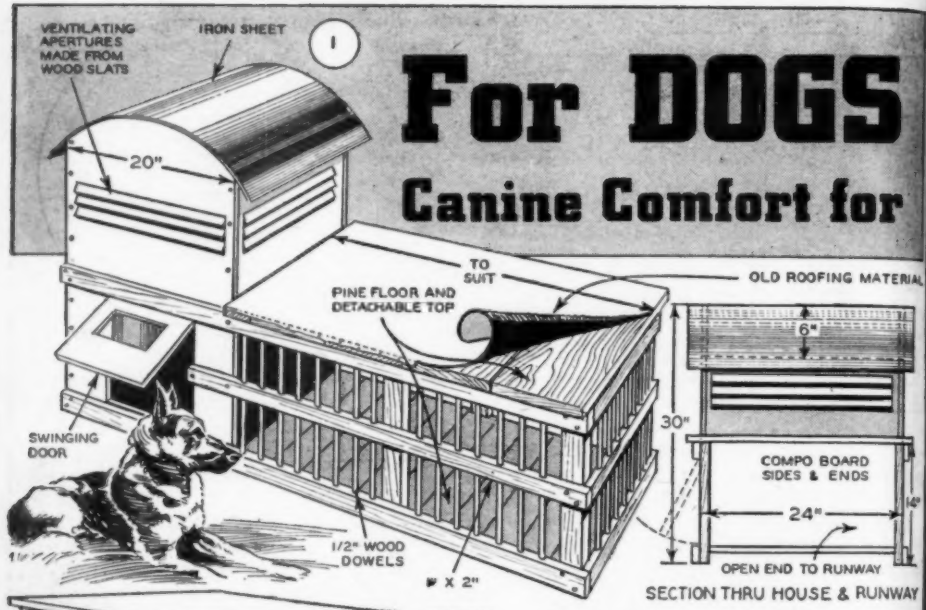
The lantern should be finished in statuary bronze paint, and if galvanized iron was used the metal should be painted with acetic acid or vinegar before painting. Carefully finished in bronze or antiqued the lantern is a very rich and attractive piece of craftsmanship. A bulb of about 25 watts may be used, and one of a soft amber tint is recommended. The three holes in the bracket afford ample support for attachment to the wall.

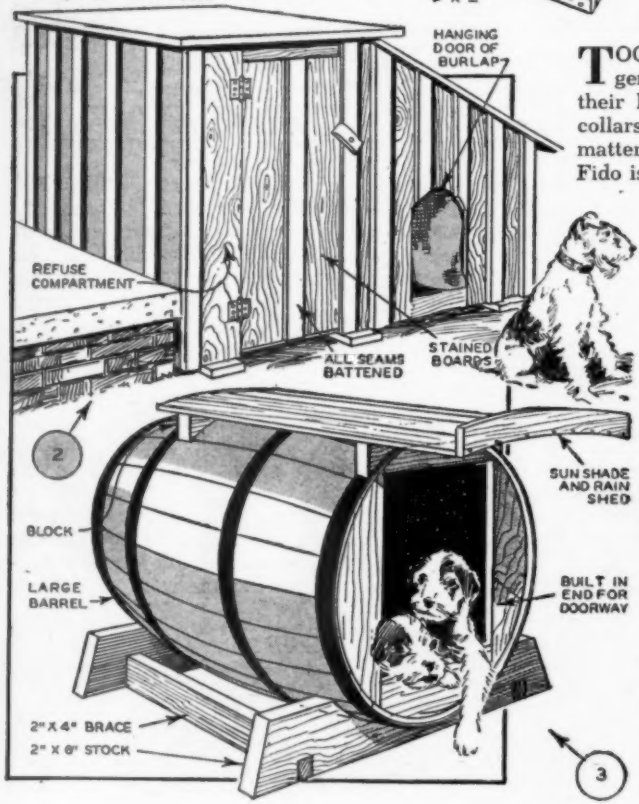
BOAT FANS AHOY!

In response to many requests we are presenting plans for a simple marine conversion of a Star four cylinder auto engine in the June How To Build section. This conversion can easily be accomplished by any home mechanic at very little expense, and has been OK'd by our naval architect, Sam Rabl. If you're planning a motor installation in your boat this spring be sure to see the June Mechanix Illustrated.

For DOGS

Canine Comfort for





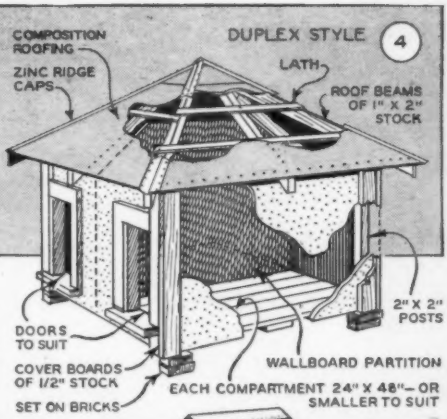
TOO many dogs don't have congenial or suitable places to hang their hats, or more correctly, their collars. In warm weather this doesn't matter much, but when winter comes Fido is apt to feel neglected. If you have spent five or twenty-five dollars for a dog, the expenditure of a few cents more and a little spare time to house him comfortably will be a good investment. The designs shown here are suggestions for a number of different types of dog domiciles; they can be built as is or altered to suit individual requirements. They are all easy and inexpensive to make, and one can be selected to fit into almost any type background. A neat, non-upsettable feeding station is also shown.

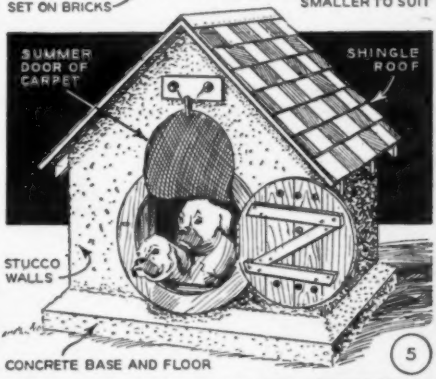
Figure 1 is a modern-design kennel and runway for the mother dog with small puppies. Made of 1-in. wood strips, composition board and maple dowels, with pine flooring and a curved sheet iron roof. Cover over the

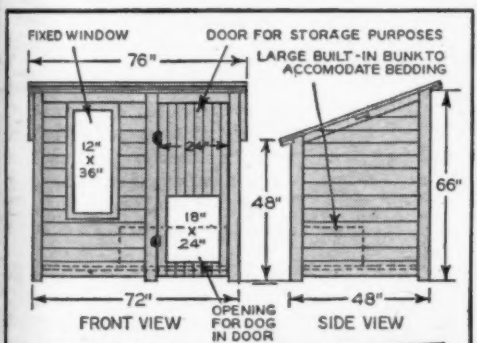
ONLY!
The Family Pet

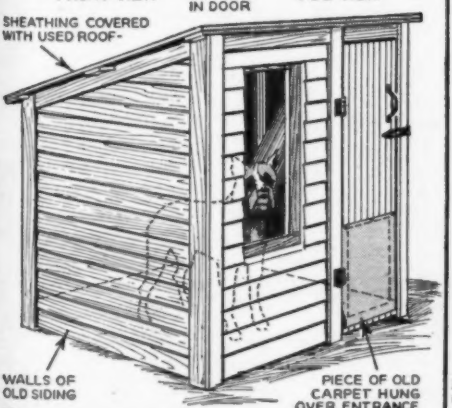
runway lifts off. Another solution to the dog-house problem is shown in Fig. 2. This structure stands at the end of the kitchen door stoop, is made of scrap lumber and combines a kennel with an enclosed recess for refuse. The boards are stained to give a rustic appearance and the cracks battened. The kennel under the sloping portion of the roof has a neat hanging door made of burlap.

Clever use of materials at hand to save cost is the feature of No. 3. This house is compact, dry and comfortable. The barrel has a square

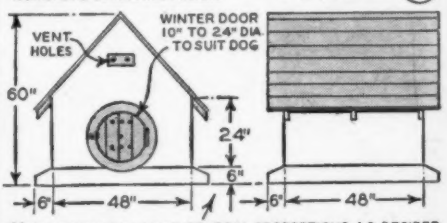




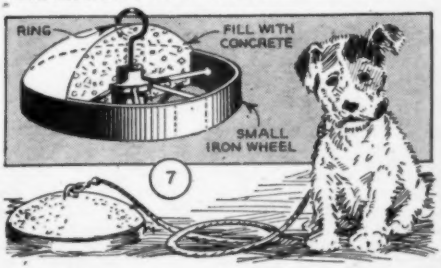




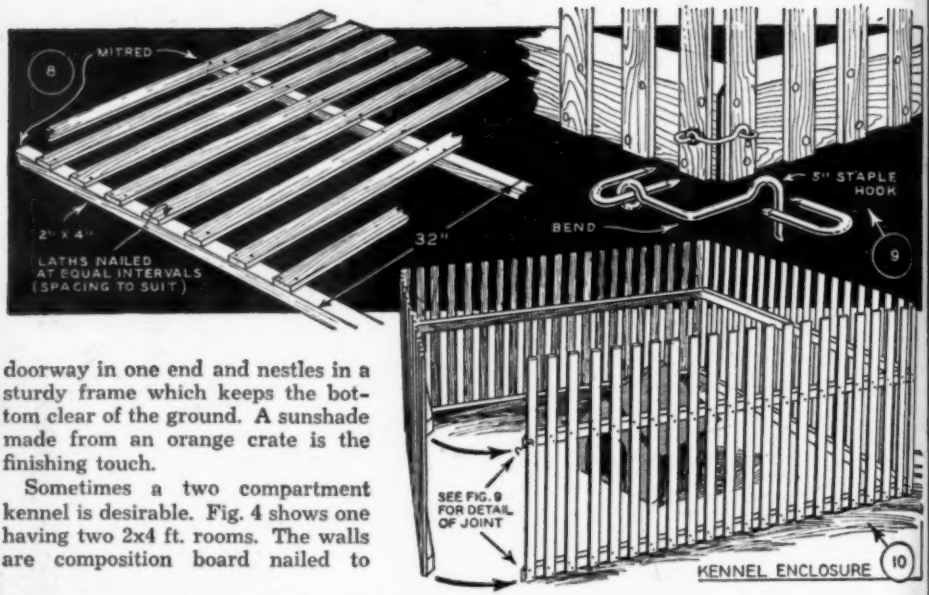
6 ISOLATED SHED & HOUSE FOR WATCH DOG



NOTE-REDUCE IN SAME GENERAL PROPORTIONS AS DESIRED



Here are doghouses to suit every taste and scene. Select the one best suited to your (or your dog's) needs, collect your tools, and go to it! You'll find them all easy to build, and for the most part very inexpensive. The portable pup anchor shown directly above is very useful in keeping that small bundle of dynamite under control.



doorway in one end and nestles in a sturdy frame which keeps the bottom clear of the ground. A sunshade made from an orange crate is the finishing touch.

Sometimes a two compartment kennel is desirable. Fig. 4 shows one having two 2x4 ft. rooms. The walls are composition board nailed to corner posts. Roof is of composition roofing. Bricks under each corner keep the floor dry.

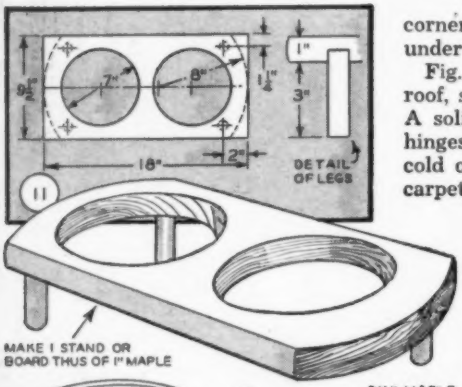
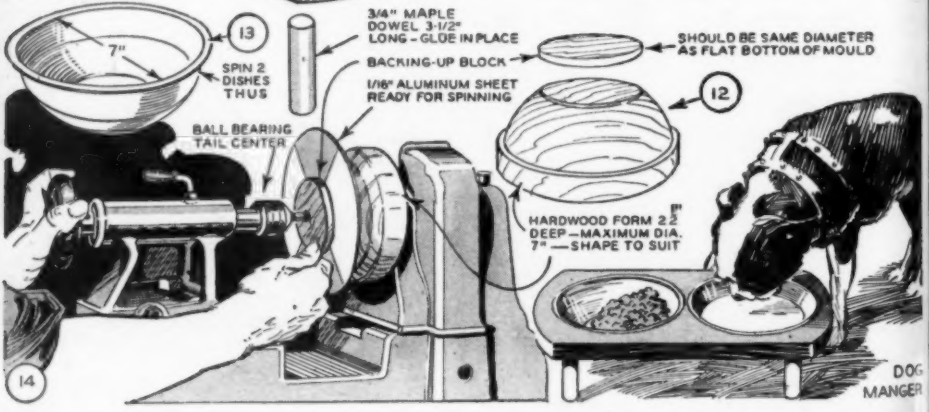
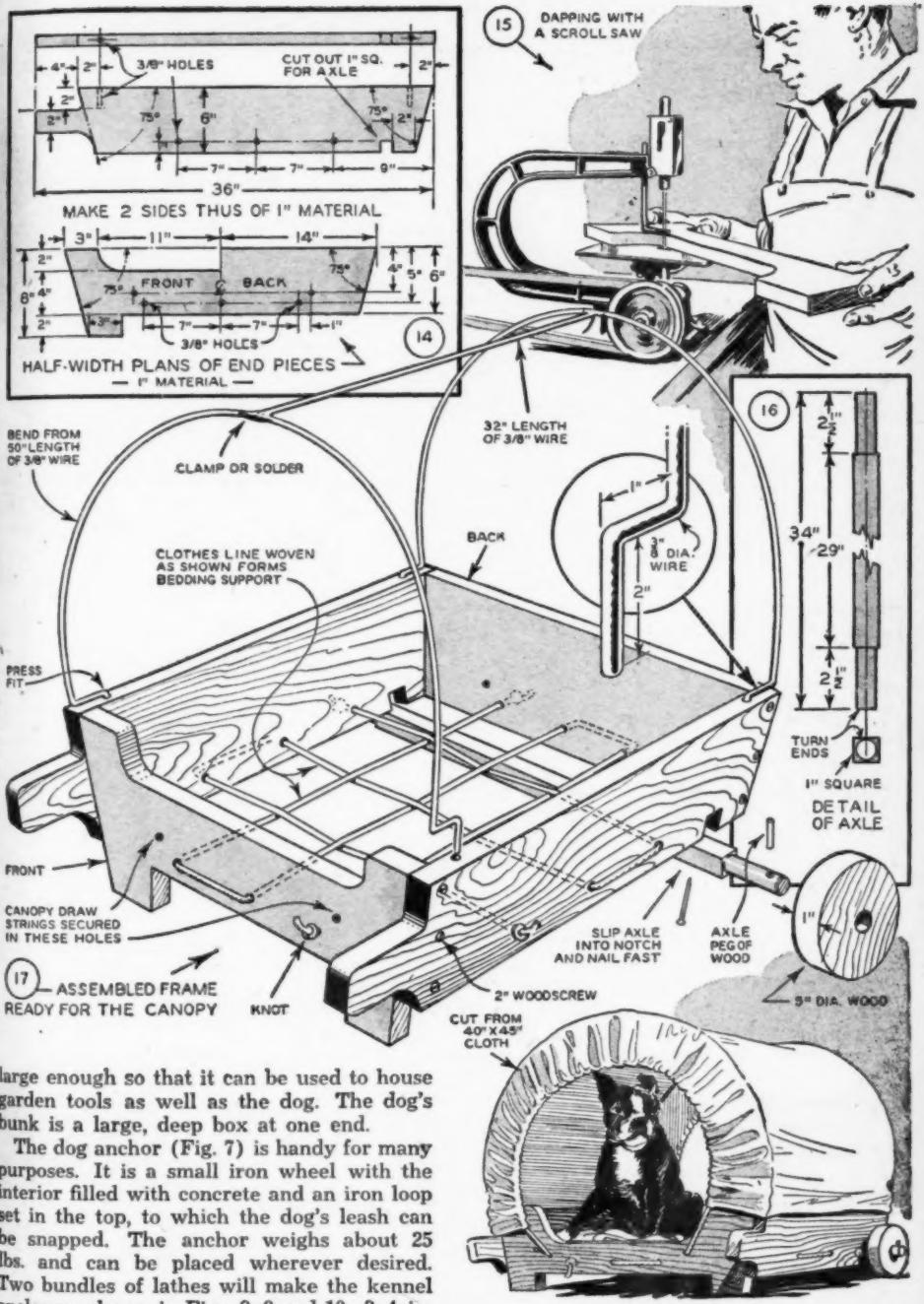


Fig. 5 shows a more elaborate kennel with shingled roof, stuccoed sides and a concrete floor foundation. A solid wood door with ventilation holes is set on hinges and swings to one side. This door is used in cold or wet weather. For warm weather a hanging carpet door is used. The kennel proper measures 4 ft. square and is large enough for two or three big dogs.

The snug kennel bungalow in Fig. 6 is intended for a watchdog. It has a large window and full height door. The building is 4 ft. wide and 6 ft. long, with a 5½-ft. front wall and 4-ft. back wall. The building is


13
7"
SPIN 2 DISHES THUS
3/4" MAPLE DOWEL 3-1/2" LONG – GLUE IN PLACE
BACKING-UP BLOCK
SHOULD BE SAME DIAMETER AS FLAT BOTTOM OF MOULD
1/16" ALUMINUM SHEET READY FOR SPINNING
12
BALL BEARING TAIL CENTER
HARDWOOD FORM 2½" DEEP—MAXIMUM DIA. 7"—SHAPE TO SUIT
14
DOG MANGER



large enough so that it can be used to house garden tools as well as the dog. The dog's bunk is a large, deep box at one end.

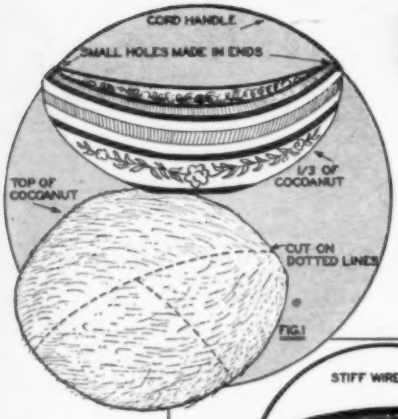
The dog anchor (Fig. 7) is handy for many purposes. It is a small iron wheel with the interior filled with concrete and an iron loop set in the top, to which the dog's leash can be snapped. The anchor weighs about 25 lbs. and can be placed wherever desired. Two bundles of lathes will make the kennel enclosure shown in Figs. 8, 9 and 10. 2x4-in. Pieces with mitered ends are laid parallel

[*Continued on page* 131]

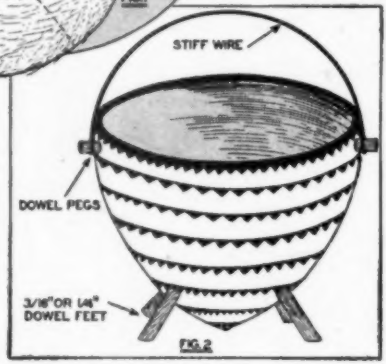
Designed to look well in any garden setting, this attractive canopied "dogbarrow" has a springy, comfortable bed, can be moved about easily on its solid wood wheels.

COCOANUTS

Useful And Entertaining
For Fun Or Profit



At right are two types of serving trays and an ash tray (below) that is guaranteed not to overflow. Cocoanut shells are very hard but easily cracked, and care must be taken in drilling and cutting. An ordinary hacksaw is excellent for latter operation.



THESE projects can all be made without much work or expense. Cocoanut shells are of distinctive tone when polished on a buffing wheel after the outside surface has been well cleaned with a steel wire wheel. Shell thickness averages about ⅛ inch. You can decorate with paint, stain or carve them as desired.

Individual Serving Trays

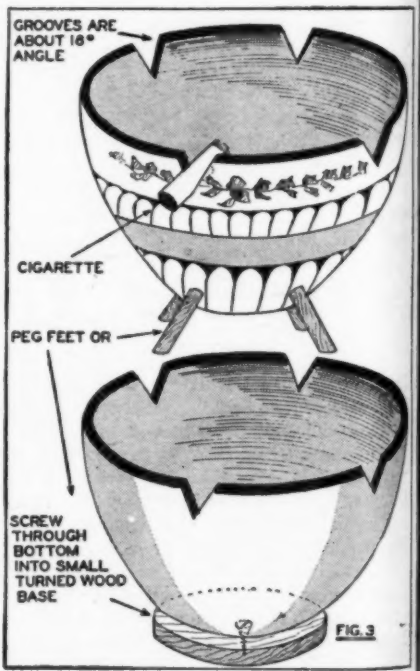
Saw a well shaped cocoanut lengthwise (Fig. 1.) along three evenly spaced lines, much as you would cut a cantaloupe for 3 people. Remove the meat and drill a small hole at each end through which tie the ends of a stiff, large cotton cord or small rope for handle. To insure each tray setting level when put down, sand a small, flat spot on the bottom of each. Two cocoanuts will make 6 trays ideal for individual helpings of nuts and candies for the next bridge party. They may equally well be used as ash trays. Colored cord may be used for the handles and the shells themselves can well be painted in gaudy colors or tints with trim.

Cocoanut Shell Kettle

Another type of tray for the living room table to hold mints or nuts is made from half a cocoanut shell which is sawed in two. Drill 4 small holes in the bottom at a slight angle and into these glue short peg feet cut from $\frac{3}{16}$ inch skewers. Glue two more pegs in holes near the top on opposite sides and slip a stiff wire bail with eyelet ends over them as Figure 2 shows.

Cocoanut Shell Ash Tray

Use half a shell and put in 4 peg feet. Saw notches at 3 or 4 places in the top as indicated in Fig. 3. The angle of these notches should be only about 18° so that cigarettes may be easily pinched into a snug position. Even though half of the cigarette projects on the outside and may be left for some time, the fire will not burn into the notch. This eliminates the danger of burned tabletops. This



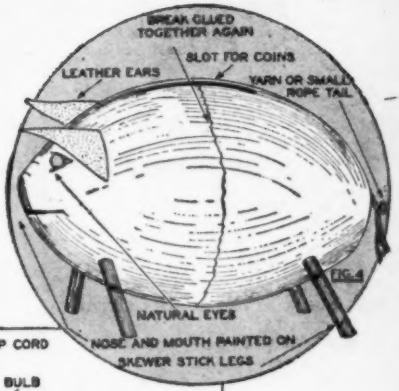
TO YOU!

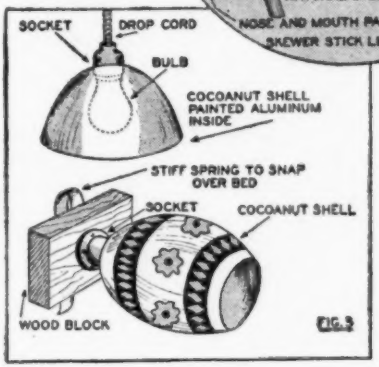
Gadgets You Can Make From Cocoanut Shells

type of ash tray is particularly appropriate for the den or outdoor porch. An alternative design is shown also, comprising a small turned wood disk about 2 inches in diameter, held in place by a screw put down through the bottom into the wood, and glued. The bottom point should be sanded slightly to provide a flat spot.

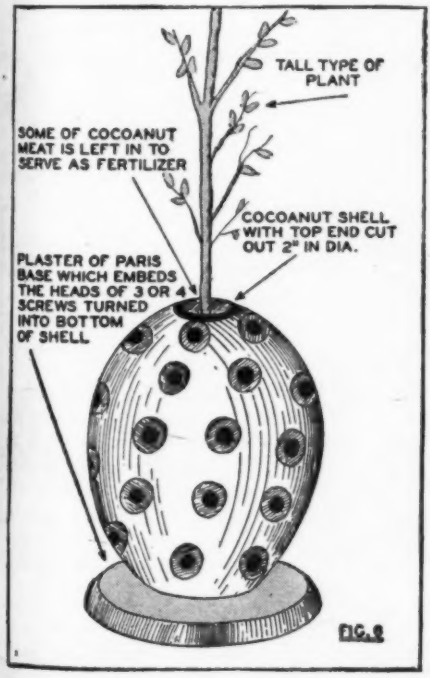
Cocoanut Pig Bank

Holding the cocoanut in the hand, slowly rotate it while repeatedly tapping a line around the middle. The shell will soon crack in two. Remove the meat, coat the edges with liquid glue and press the halves firmly together again, locking them tightly until the glue sets. Then cut a slot in the top of the back, using two of the natural nut spots for eyes. Paint on nose and mouth. Drill a small hole in the back end and into this glue a short length of fluffy cotton for the tail. Cut a slot above each eye as narrow as possible and ½ inch long. Into each of these glue triangles of leather cut from an old shoe for ears. Finally glue four skewer legs into holes as shown and sand all ends evenly so the pig will stand upright. The shell may be painted all over if desired, or left the natural color after polishing. The average size cocoanut will hold about $100 in dimes, $30 in nickels and $9 in pennies. You need only crack the pig with a hammer to remove the contents when full. Finished pig is seen in Fig. 4.





The cocoanut pig bank above has a large appetite for change, and can accommodate about $140 in dimes, nickels and pennies. Left: Two forms of lightshade. A cheap lens could be slipped into the front of the lower one, making it into an efficient spot lamp.


TALL TYPE OF PLANT
SOME OF COCOANUT MEAT IS LEFT IN TO SERVE AS FERTILIZER
COCOANUT SHELL WITH TOP END CUT OUT 2" IN DIA.
PLASTER OF PARIS BASE WHICH EMBEDS THE HEADS OF 3 OR 4 SCREWS TURNED INTO BOTTOM OF SHELL
FIG. 5

Light Shades

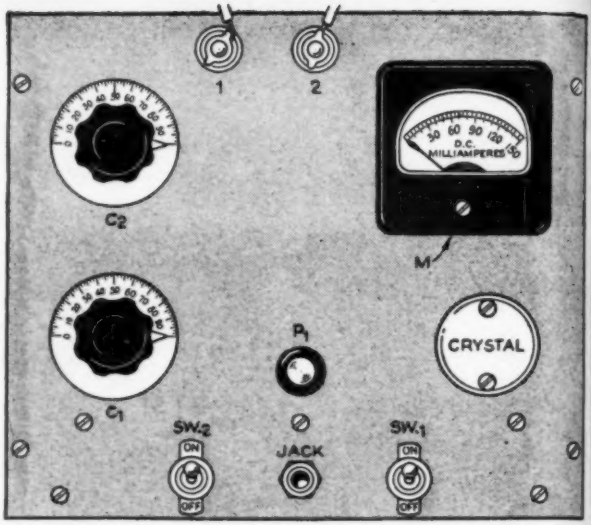
Figure 5 shows two easily made shades from cocoanut shells. The upper type consists of half a shell, cleaned and polished, with a hole cut in the top just large enough to admit the neck of the bulb to be used. This should be of low-wattage and squat in shape. Give the inside of the shell a double coat of aluminum paint. The result is a good shade for any drop light.

For the other type, cut off both ends of the cocoanut and after removing the meat, paint the

[*Continued on page* 143]

The "MIGHTY MITE"

Do you want to "go on the air" as a radio amateur with a transmitter of your own? Here is a simple, easily-built rig that will work the first time you turn on the juice!



Simpler in construction and appearance than most receivers, the "Mighty Mite" is an attractive addition to any radio fan's "shack". The front panel measures only 7x8 inches and has all the controls conveniently arranged for quick tuning. The parts are marked to correspond with the schematic diagram on page 92.

by Howard G. McEntee,
W2FHP

SIMPLICITY is the keynote of the "Mighty Mite"; in fact, this compact transmitter is so simple that at first glance several necessities appear to have been omitted from the circuit diagram. (See page 92.) Such is not the case, however, and the little rig illustrated will put out a clean, husky short wave signal that should enable a beginner to snare a good deal of local and DX contacts on the popular amateur bands. The "Mighty Mite" was designed especially for MECHANIX ILLUSTRATED to meet the demands of many readers who are interested in "getting on the air" and communicating with other amateur operators. It is the very simplest short-wave transmitter that can possibly be built, yet it is rugged and reliable in all respects. After its owner has gained some operating experience, and wants to enlarge his station, the "Mighty Mite" can be used without change as an "exciter" unit for a higher-powered rig.

Since this was worked out a beginner's unit, safety was kept paramount. For this reason the output circuit is of the so-called parallel feed style, with the plate inductance L1 and the tuning condenser C1 isolated from high voltage D.C. With the exception of the terminals on the meter, which should be taped, it is impossible to get a "jolt" from anything above the chassis. Thus, if the newcomer, in a burst of excitement at hearing some hot DX, should reach into the case to change coils with the power on, even if the key were closed, he could not possibly be shocked. At most, an R.F. burn would result, but it would not knock the operator flat, as might be the case were the simpler series feed used.

While the features of safety and simplicity make the "Mighty Mite" of great interest to the beginner, it is also handy for the experienced ham* as well, since it is ideal for a portable transmitter to take along on a trip or vacation.

While all bands from 160 to 10 meters may be covered, the transmitter is designed for optimum results on 80, 40, and 20 meters. On 10 meters, the efficiency of the parallel feed plate circuit is poor, and series feed must be used to get good results.

The plate coils L1 are plug-in, and are of commercial make, although the coil chart on page 92 gives details for those who wish to make their own. The coils used come with a link winding of several turns. This is insufficient for most antenna coupling needs, however, since the link is designed for interstage coupling in multi-tube transmitters.

*For the benefit of readers who may be somewhat startled by this term, let us explain that short-wave radio amateurs the world over refer to themselves as "hams." No one knows why, but they do.—*Editor.*

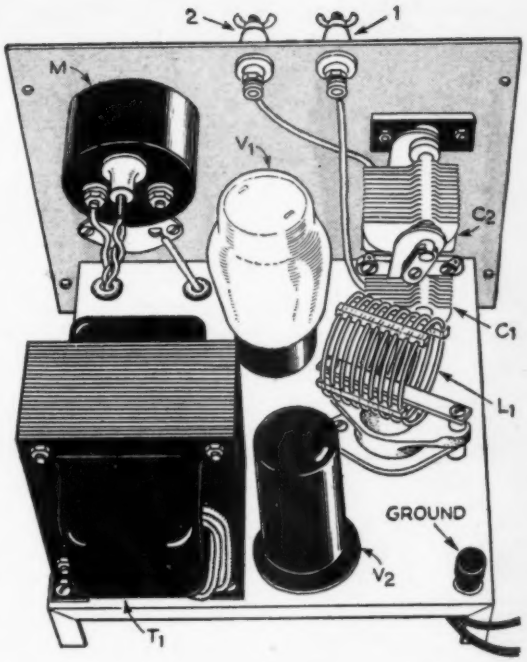
While they do no harm if left on, the link windings were clipped off the coils shown. The center tap is also unnecessary and may be removed. Due to rather high stray circuit capacities, the 20 meter coil would not quite reach the band in its original state, so two turns were removed. All other coils may be used as purchased.

Antenna coupling is a subject upon which reams may be written. Simple provisions were provided in the transmitter for antenna coupling to some types of antennas, notably the single-wire feed. For such use, the feeder is run to terminal 2 on the front of the set, and 1 is not used. A small clip bent out of thin spring brass connects to one side of condenser C2, and is fastened on the various coils so that proper loading is achieved.

For connection to tuned or untuned 2-wire feeders, a coupling coil, L2, must be made and slipped over the outside of L1 so that it can be slid back and forth to vary the loading. C2 may be used either in parallel or in series with L2, when connected to a "Zepp" antenna. For untuned feed lines, L2 is connected direct to posts 1 and 2, the connections shown on these posts being first removed. Since L2 will vary in size for each coil, it may be made an integral part of each, and connected to the former fixed link pins in the base. Pushback wire is quite satisfactory for L2.

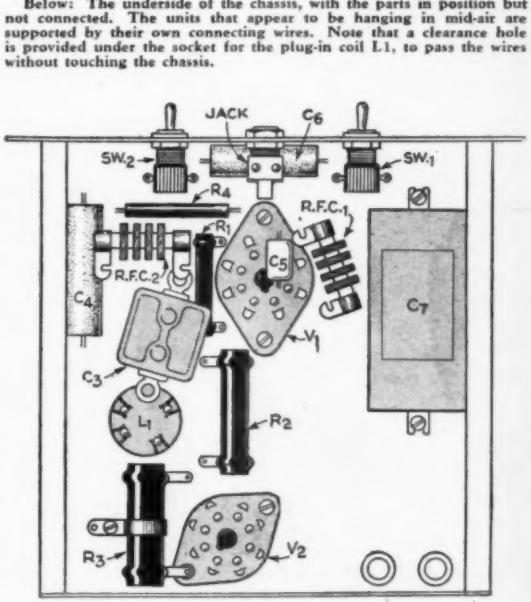
Construction is begun by marking out the chassis and cutting all holes as indicated on page 92. Next, mark the panel and drill it out; a red pencil will facilitate the latter work. Be sure to mount the filter condenser, C7, as shown, since there is plenty of room for it there. Assemble the parts on the chassis, then fasten the panel and its components. Condenser C1 is mounted directly on the metal chassis. C2, however, must be insulated from the panel. It is held in place by a piece of Victron (or other good insulating material) 1¾"x¾"x⅛", which is held about ¼" away from the front panel by means of spacers.

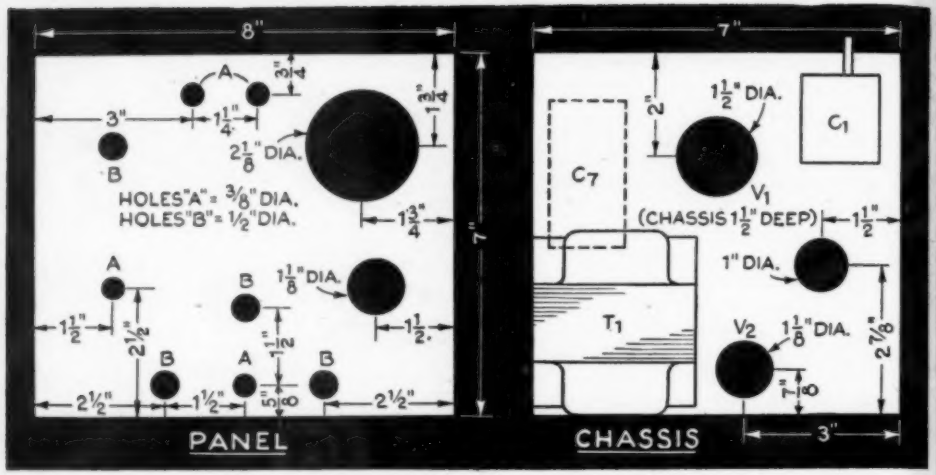
Although ceramic sockets are used for the 6L6G tube and the coil, plain bakelite wafer types suffice for the 5T4 and the crystal, although special



Above: This back view shows the essential placement of the parts of the "Mighty Mite." Note that variable condenser C2 is mounted on a small insulating strip to isolate it from the panel, which is grounded. The socket for the crystal holder is partially hidden by the meter M. The socket for the plug-in coil L1 is mounted about ¼" above the chassis by means of brass collars through which the mounting screws pass.

Below: The underside of the chassis, with the parts in position but not connected. The units that appear to be hanging in mid-air are supported by their own connecting wires. Note that a clearance hole is provided under the socket for the plug-in coil L1, to pass the wires without touching the chassis.





These drilling layouts are exact for the parts specified below. Of course, if other makes of equivalent electrical characteristics are used, it is a simple matter to relocate the holes.

2-prong holders for the latter may be used if on hand.

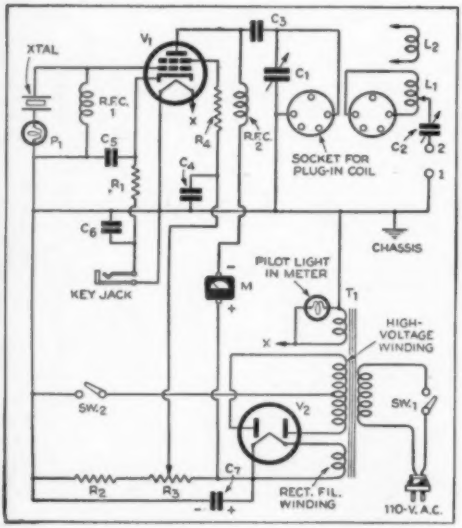
The bulb P1 is mounted in its socket so that the glass projects through the panel. A rubber grommet protects it. The lug connecting to the outer shell of the socket is soldered directly to the chassis top.

Wiring is done with pushback throughout. Connect all A.C. leads first, as this will dispose of the loose ends coming from the transformer. The latter has several extra filament leads that are not needed. Tape these up and poke them back of the filter condenser. The unused leads are colored blue, green, blue-white, and brown-white.

Make sure the filter condenser is the unit specified, as the common 450-volt units will promptly break down in this position. This filter, incidentally, is quite adequate to get a good D.C. note, and extra condensers or chokes are not needed.

After checking over all connections, insert tubes and the 80-meter coil and crystal. Set the tap on R3 as shown, that is, near the junction of R2 and R3. Turn on the power and note the plate current. This should be about 90 ma. with the crystal out of its

[*Continued on page 132*]



List of Parts

T1—Power transformer (U. T. C. No. R3)
V1—6L6G tube (R. C. A.)
V2—5Y4 tube (R. C. A.)
M—150 Ma. meter (Triplett type 227 A, illuminated)
C1—150 mmf. variable (Bud MC907)
C2—200 mmf. variable (Bud MC908)
C3—.01 mf. mica (Aerovox 1450)
C4—.1 mf. paper (Aerovox 684)
C5—.0002 mf. mica (Aerovox 1488)
C6—.1 mf. paper (Aerovox 484)
C7—8 mf. electrolytic, 600 volts (Aerovox PB5600)
R1—300 ohm, 10 watt wire wound (Aerovox 931)
R2—40,000 ohm, 10 watt wire wound (Aerovox 931)
R3—10,000 ohm, 10 watt wire wound (Aerovox 952)
R4—50 ohm carbon (Aerovox 1094)
Crystals—One each 20-40-80 meters. (Hipower)
Case—One 7"x8"x7½" (Bud C973)
Chassis—One to fit above case (Bud CB41)
RFC—2.5 mh. chokes (Bud CH920)
L1—One each 20-40-80 meter coils (Bud OEL 20, OEL 40, OEL 80)
Dial Plates—Two (Bud DP717)
SW1, SW2—S. P. S. T. toggle switches (Bud SW1115)
Sockets—One 5-prong ceramic (Bud S955) for plug-in coils L1.
One 8-prong ceramic (Bud S959) for 6L6G.
One 8-prong Bakelite (Bud S390) for ST4.
One 5-prong Bakelite for crystal.
Jack—One, Bud J232 (for key)
Plug—One, Bud FP230 (for key)
Insulators—Two feed-through type (Bud 1435)
P1—2 Volts pilot bulb and socket (used in crystal circuit)
1—Power line cord.

Note: Turn on switch SW1 first and let the tubes warm up for at least 30 seconds. Then close SW2, press the key, and adjust the tank condenser C1 as desired.

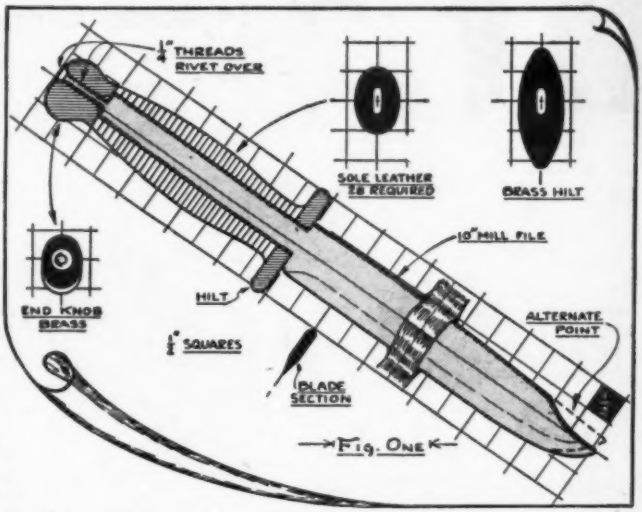
COIL CHART

	Turns L1	Wire For L1	Turns L2
80 Meters	32	No. 18 Bare Copper	10
40 Meters	19	No. 16 Bare Copper	6
20 Meters	9	No. 14 Bare Copper	3

Note: All L1 coils are 1⅛" in diameter, with the turns spaced out to make the whole winding 1⅝" long.
All L2 coils are No. 18 pushback, close wound.

A Hand Made Hunting Knife

FOR hunting, camping or fishing few implements are as useful as a good sturdy knife, and for the chap who likes to make things dual satisfaction will be derived from the fabrication of such a knife. The makin's are probably down in the basement so all you have to do is get them together. You will need the following items: A discarded 10-in. mill file, an old pair of shoes and two small pieces of brass.

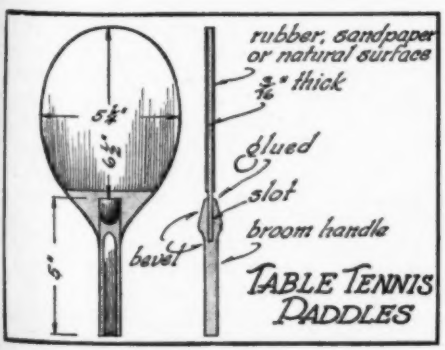


First toss the file into the furnace and heat it up to a bright red. Remove it from the fire and allow to cool slowly. When cold mark off the shape of the blade shown in Fig. 1 on the file and grind roughly to shape. Keep a can of water handy to cool the work. Grind off all of the file milling and round the back of the blade. Grind off the handle end and thread for about 1-in. using a ¼-in. die. Now hone the blade on a stone until all grinder marks are gone. At this point the blade must be tempered. Place the knife back in the furnace in such a manner as to heat only the blade. Watch this carefully and when the blade is uniformly a cherry red plunge it into a bucket of cold water. You must not get the handle portion in the water. If any scale has formed on the blade remove this with emery cloth.

Next from a piece of brass ¼x¾x2-in. long grind the hilt piece. Round the edges and drill two holes in the location shown in Fig. 1, then remove the metal between with a cold chisel. Now file smooth, polish with steel wool, then buff. Now for the shoes. From the soles cut out about 28 to 30 pieces of good leather about the shape shown. Just rough these out and then punch out the center with a chisel. From a block of brass about

[*Continued on page* 143]

SPECIAL TABLE TENNIS PADDLES

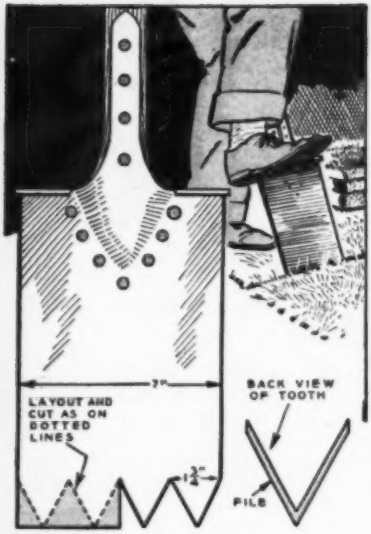


MAKE your own table tennis paddles, with either rubber, sandpaper or natural surface. Plane down a pine board until it is 3/16-in. thick. After you have sketched a graceful outline of the required dimensions, trim it out with shears. Trace around the pattern upon the thin board, and cut it out with a scroll saw. Make the handle from a section of broom handle, or piece of soft pine. Note the top and bottom surfaces of the grip are flattened or beveled, and also the sides at the upper end. Saw a slot in the upper end 2-in. deep, and glue and nail the lower end of the paddle in the slot.—*E. V. H.*

HINTS FOR THE

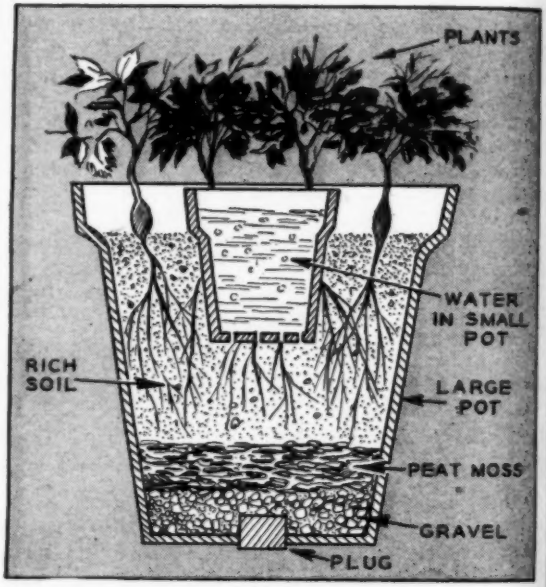
Improved Garden Spade

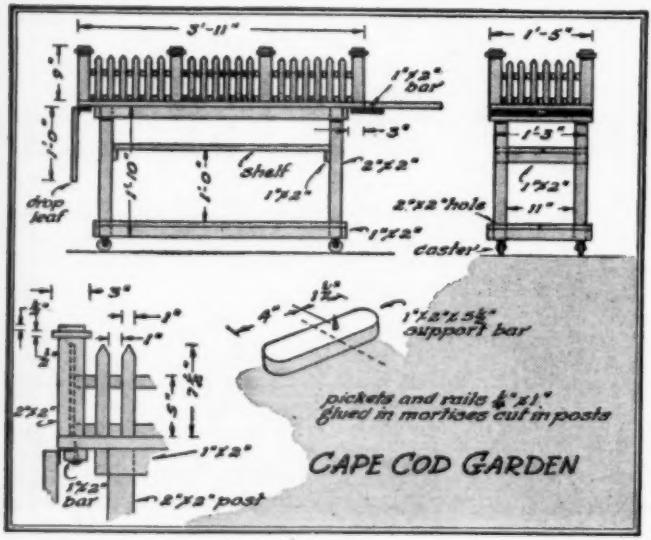
AN ORDINARY square garden spade can be greatly improved for certain tasks if altered as shown at left. Bottom of blade is cut with a hacksaw and the teeth thus formed filed on the back until sharp.—*L. J. M.*



Double Pot Plant Starter

ONE of the neatest ways to hurry up early plants is to use two flower pots of different sizes in the manner shown. Fill the large pot with gravel for an inch, put some peat moss on this, then set the small pot inside, centered. The hole in the large pot must be tightly plugged. Set the plants around the ring of earth and keep water in small pot.—*D. V. H.*





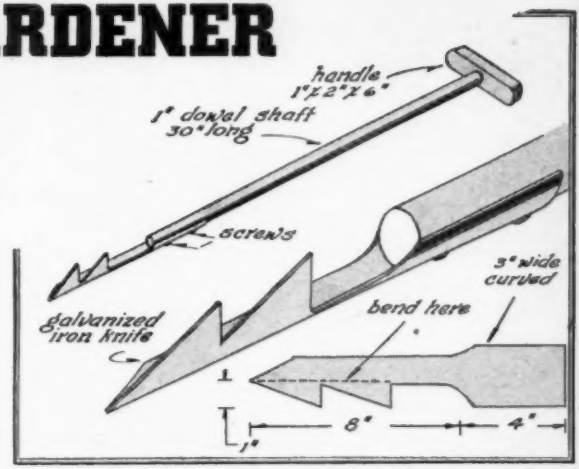
"Cape Cod" Garden

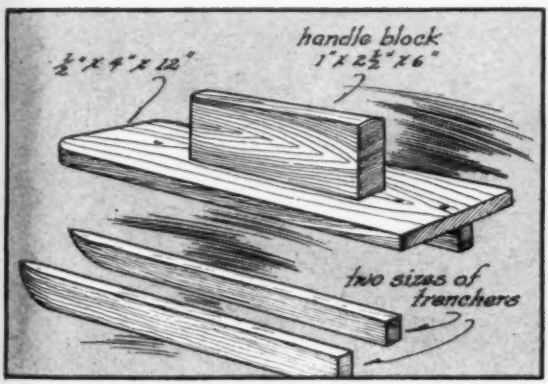
TWELVE feet of 2x2-in. stock and some boards from packing boxes will be all the material required to make this prim little garden fence and table for your potted plants and flowers. Two drop leaves at the ends of the table give you extra space for plants, or for books and magazines. The table or stand is 3 feet 11-in. long and 1 foot 5-in. wide at the top, and consists of two boards cut and finished, and nailed to the rails. Boards are nailed around the top for the rails, bringing the [*Continued on page* 142]

SPRING GARDENER

Simple Dandelion Weeder

KEEP those pesky dandelions from running riot with this handy weeder. Use a discarded hoe handle for the handle, making it about 36-in. long. The knife or point is made from galvanized iron, cut out in one piece as shown. The end is sharpened to a point and two hooks, each about 2-in. long, are cut along one side. Bend the hooks on the dotted line so that they are at right angles with the rest of the knife. Fasten the knife to handle with short screws.





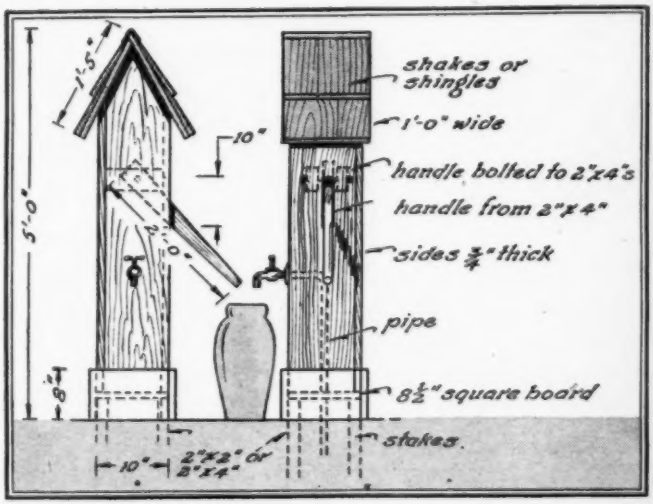
Seed Trencher

YOU can make trenches for the garden that are uniform in depth, with this simple trencher. The rudder or digger is either 1 or 2-in. deep, 1½-in. thick, and 12-in. long. Note that the front ends are sharpened and curved to make a clean groove in the soil. The surface board, which slides along the ground is ½x4x12-in. Screw the trencher board to the middle of the surface board, on the underside. Make a handle block and nail it to the upper side of the surface board.

Garden Pump

WHERE a hydrant or faucet protrudes at the end of a water pipe in the garden or back yard, a picturesque old-fashioned pump can be built around it in such a manner that the pipe is both hidden and kept practicable. Use ¾-in. pine stock in making the pump house, assembling the four sides to form a pump house 10 or 11-in. square and about 5 feet high. Two sides are gabled at the top, and boards are nailed in place

[Continued on page 142]



The Modern

Half of a double garage is an ideal location for the modern farm shop, and a suitable layout is illustrated at right. If a separate shop building is desired, the underground type in Fig. 3 is excellent for dry localities. Walls are of tile.

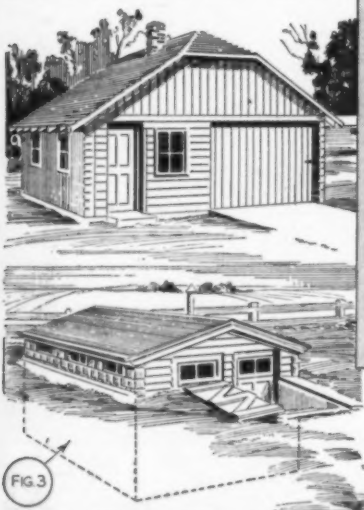
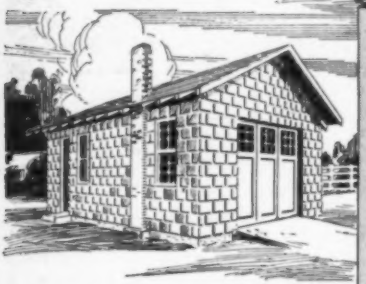


FIG. 3



A single garage can also be made to house very complete shop equipment, as well as the car. The building above has a concrete floor and foundation, and is practically damp-proof.

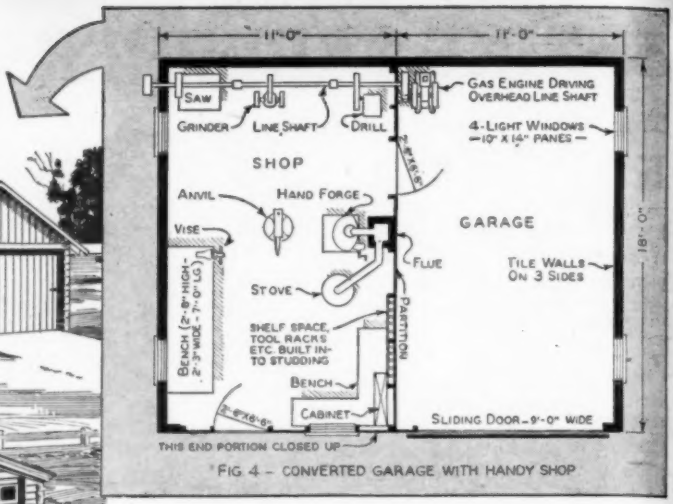


FIG. 4 – CONVERTED GARAGE WITH HANDY SHOP

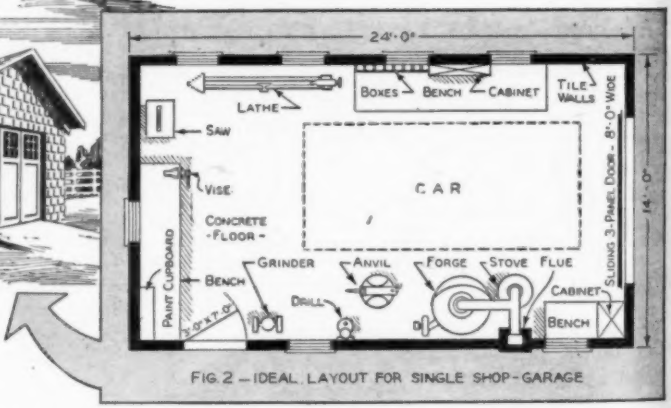


FIG. 2 – IDEAL LAYOUT FOR SINGLE SHOP-GARAGE

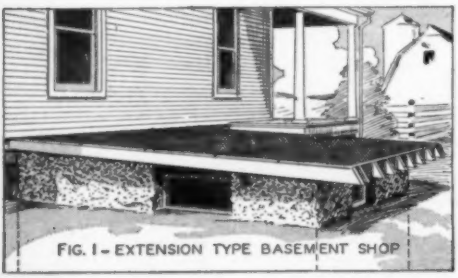


FIG. 1 – EXTENSION TYPE BASEMENT SHOP

When the basement is too small or too crowded to properly house the shop, an extension can be added, as above. The roof should have a slight pitch for drainage.

by Dale Van Horn

ON A RECENT rainy day I drove past an up-to-date farm and noticed considerable activity in the yards. Investigation showed that this enterprising farmer had a pretty well equipped shop and three neighbors had come over with repair work to be done. Some farmers, comes a rainy spell, will jump in the car and go to town. Others putter about the place. Neither of these occupations is particularly profitable. But the farmer who is also a good mechanic, who

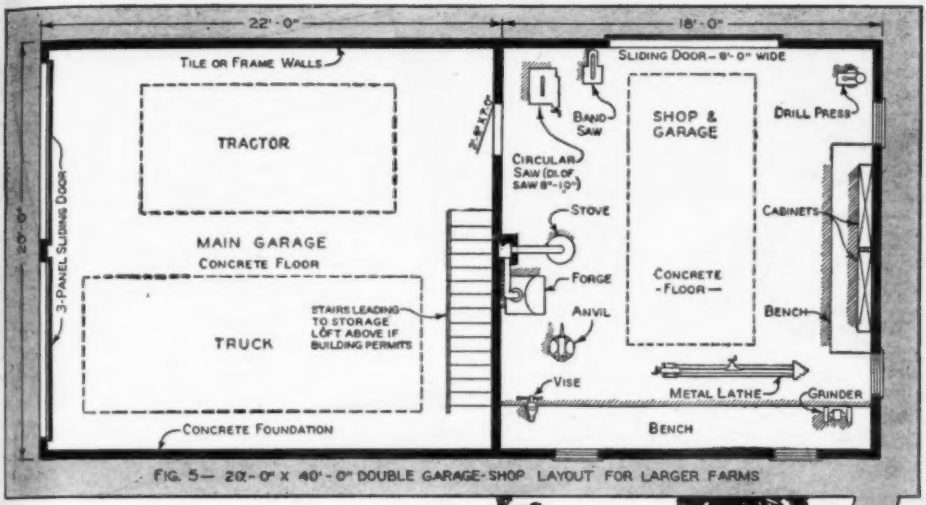


FIG. 5— 20'-0" X 40'-0" DOUBLE GARAGE-SHOP LAYOUT FOR LARGER FARMS

Farm Shop

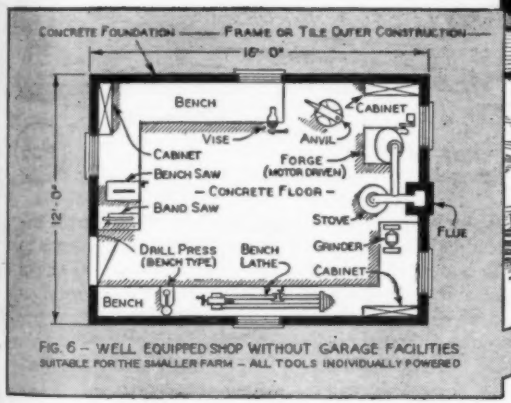
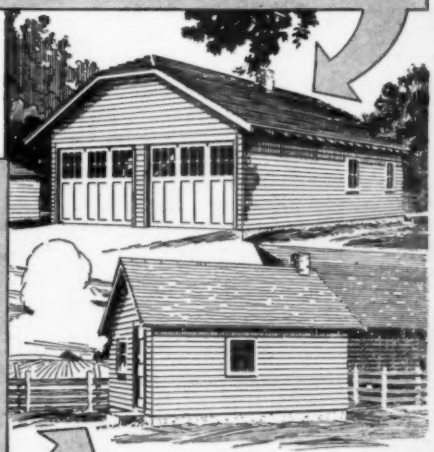


FIG. 6 – WELL EQUIPPED SHOP WITHOUT GARAGE FACILITIES
SUITABLE FOR THE SMALLER FARM – ALL TOOLS INDIVIDUALLY POWERED



At top is a more ambitious layout, designed for the bigger farm with greater floor space in its buildings. In the plan at left the bench saw can be located in front of the window if it is necessary to rip long planks.

has built up a good shop right on the place, can turn a pretty profit from this equipment by not only doing much of his own repair and simple construction work, but also by doing it for neighbors and friends.

This article gives a number of useful suggestions for laying out, equipping and maintaining the modern farm shop. City folks have long enjoyed the extra efficiency and fun of motor-driven shop machines. With the rapid strides recently made in electrification of rural communities, many farms today also are provided with unlimited, economical power at the flip of a switch. The old adage about the farm shop comprising an anvil, forge and rusty saw can today be elaborated upon. The anvil and forge are still important —unless an acetylene torch has taken their place.

But to this fundamental equipment should be added a bench saw, bench or floor type of drill, even a bandsaw and lathe. One of the modern, roller bearing, back geared metal turning lathes is truly a vital adjunct to the modern farm shop. It permits the machining of numerous parts for different farm ma-

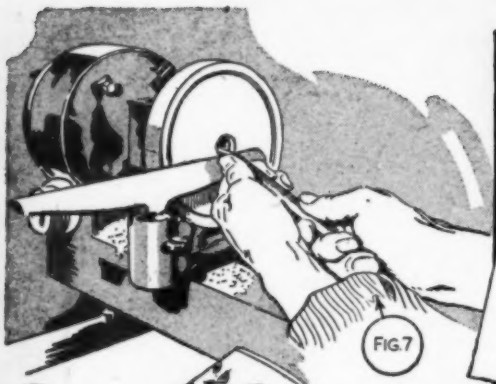


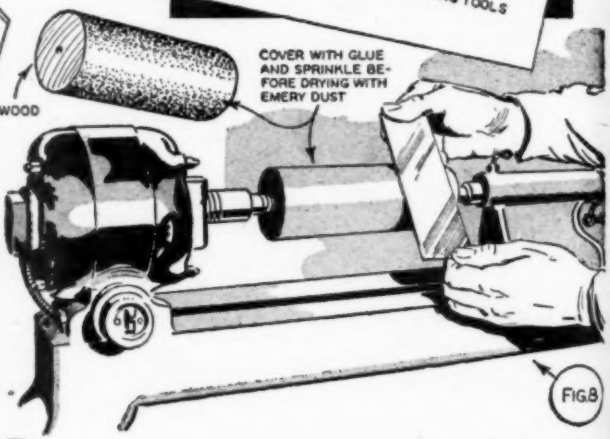
FIG.7

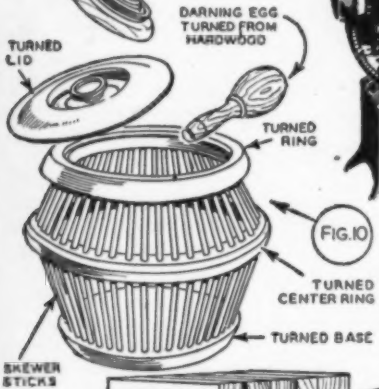
SHOP EQUIPMENT LIST

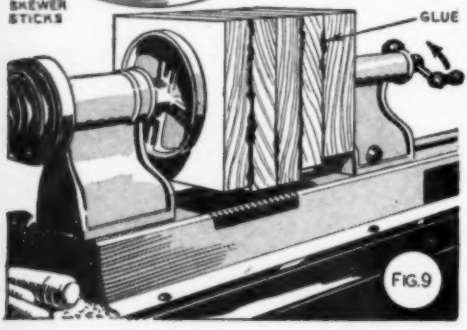
DRILL PRESS — BENCH OR FLOOR TYPE
CIRCULAR SAW — 8 TO 10 INCH DIA. BLADE
LATHE — EITHER WOOD OR METAL OR BOTH
JIG OR BAND SAW - BENCH OR FLOOR TYPE
GRINDER — BENCH OR FLOOR TYPE
FORGE — MOTOR DRIVEN TYPE PREFERRED
BENCH VISE — WOOD & METAL DESIRABLE
ANVIL — CAN BE HOME-MADE (SEE FIG 12)

MISCELLANEOUS

BLOW TORCH • BUFFING, SANDING AND EMERY WHEELS FOR LATHE • HAND SAWS (CROSS-CUT AND RIP • PLIERS • TIN SNIPS • CUTTING TOOLS



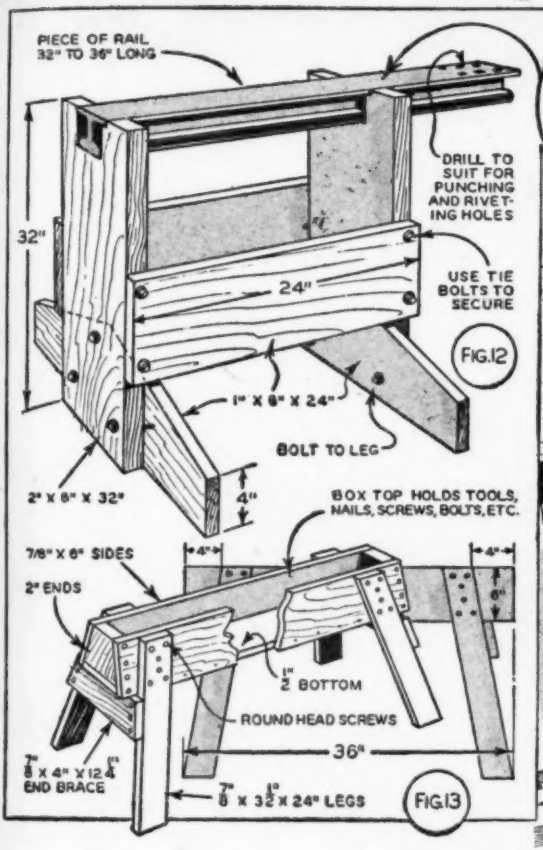


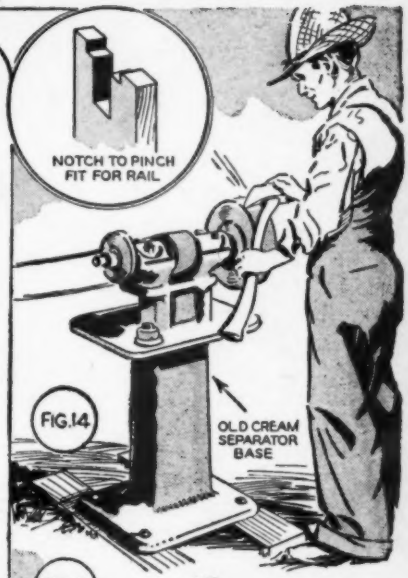


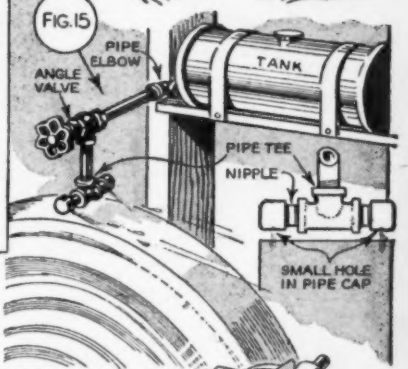
Of all shop machinery the lathe is the most useful, and will perform the greatest number of operations, especially if it is the metal working type. The drawing shows some of the things that can be done on and with a lathe. All are fully described in the text.

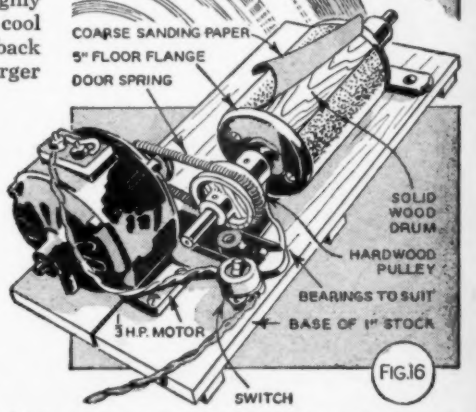
chines, including the cutting of threads of almost innumerable variations. One farmer who not long ago installed one of the smaller metal lathes (it has a 9-inch swing) estimated that in less than 9 months it had paid for itself.

Someone recently asked: "What is the best location for the farm shop?" There are at least a half dozen places on the farm where the shop can be properly installed. This exceeds by three or four, the possible locations for town and city shops. Of course the ideal spot is in a building, preferably of masonry, especially built for it. The next location, which is first choice with many, is in one end of a large garage. The same building can then house the car, truck, tractor and shop. A corner room in the granary will also suffice and sometimes a corner may be partitioned off in the large granary without much bother and with little attending expense. Even the two-stall garage is ideal, preferably with a partition so that the shop may be heated in winter more economically. One end or corner







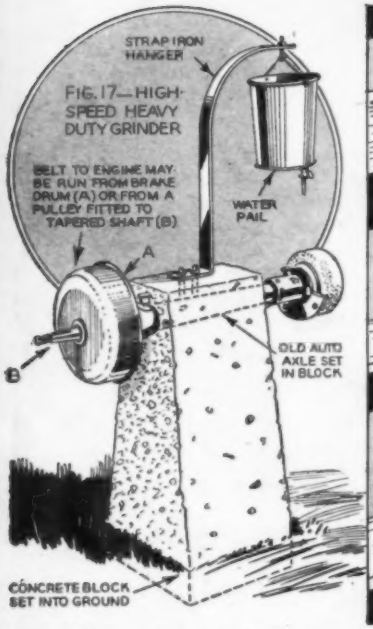


Much useful farm shop equipment can be easily homemade. Above are pictured a rail anvil, box top saw horses, heavy grinder on cream separator base, run by the tractor, rig for power-turned indoor whetstone, and a drum sander driven by a washing machine motor.

of the implement shed is also another good shop location. If the home is modern, the thoroughly concreted basement is a shop location which is cool in summer, warm in winter. Its chief drawback seems to be the inconvenience of getting larger projects in and out through the grade door.

Even when the basement is too small or has been previously divided into rooms, each serving a special purpose, you may use the basement for the shop in the manner shown in Figure 1. Here an added basement room was built at the side of the house, roofed over with a slight pitch, and a snug 12 by 12 foot area created for a modern shop. There is plenty of light and the windows on three sides permit long timbers, boards or pipe to be placed in the shop conveniently.

Cornell Extension University, Ithaca, New York, recommends as the ideal farm shop, a building 40 feet long, 20 feet wide and laid out as shown in Figure 5. Provision is provided for storage space under the roof and


STRAP IRON HANGER
FIG. 17—HIGH-SPEED HEAVY DUTY GRINDER
BELT TO ENGINE MAY BE RUN FROM BRAKE DRUM (A) OR FROM A PULLEY FITTED TO TAPERED SHAFT (B)
WATER PAIL
A
B
OLD AUTO AXLE SET IN BLOCK
CONCRETE BLOCK SET INTO GROUND

DRILL HOLES TO SUIT FOR BITS AND SMALL TOOLS
4" X 4"
PARTITIONS TO SUIT FOR SCREWS, ETC.
CLEAT
SHELVES FOR PAINT ETC., ETC.
FIG. 18—UTILIZING STORAGE SPACE IN BETWEEN STUDDING

A good high-speed grinder can be cheaply made from the rear axle of a junked automobile. A concrete block forms the base, and a belt is run to the power plant from the brake drum. Right: In frame buildings neat storage shelves may be placed between the uprights.

steps are built against the shop wall. Notice the arrangement of machines and equipment in this building. Figure 5 is shown as a modern double garage-shop of the same dimensions, either frame or tile and with or without a second story. It suggests the spaciousness of this type of building. The design is especially appropriate for the large farm with much motorized equipment.

The 12 by 16 frame building shown in Figure 6 is a good type of isolated shop for the smaller farm. A flue at one end permits the use of both forge and stove. Note that it sets well above the ground on a concrete foundation and, with its concrete floor, insures an interior dryness which is desirable.

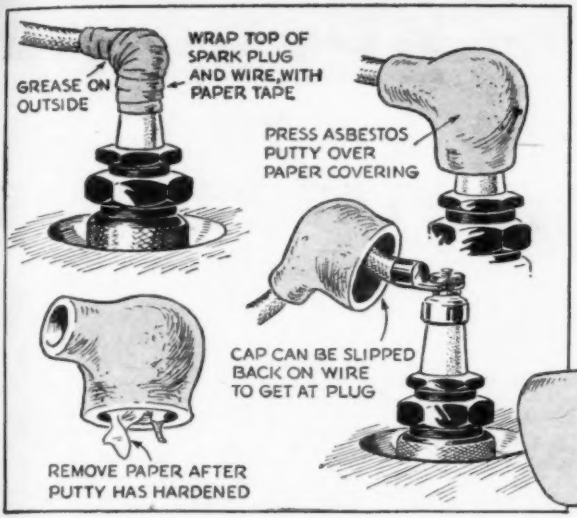
The standard square garage type of building, divided into two rooms of equal size and with a layout like that shown in Figure 4, is always a good bet. This installation has a gas engine for power plant that is anchored in the garage but which operates a line shaft running clear across the end of the shop.

Perhaps the ideal farm shop building is one similar to that shown in Figure 2. Especially appropriate for the smaller farm, it is of tile, 14 feet wide and 24 feet long, rests on a concrete foundation, has a concrete floor. As will be noted, this building also serves as the family garage. There's plenty of window space, bench space and storage space. The flue will accommodate both a forge and stove, which may be of the home-made, oil-burning (filtered, old crank case oil will do) type.

One farmer built the underground shop shown in Figure 3. Dampness is largely overcome by waterproofing the tile walls. Here, too, is housed the 32-volt lighting unit whose engine provides power for the machine lathe and saw. Broad steps lead down to the shop, permitting the removal of large, bulky projects after completion. Such a shop location is especially appropriate for farms in dry localities for the underground feature permits easy heating in winter and there is little if any dampness in summer.

What about the power plant? Given a choice of all types of power plants, the wise shop owner will pick machines with individual electric motors and use V belts between motor and machine. The small electric motor of a size just large enough to adequately handle the machine at all times, uses less current and therefore at a cheaper rate, than any other hook-up. If the machines to be used are adapted to flat belts then perhaps the line shaft and a large, single motor will

[*Continued on page* 134]

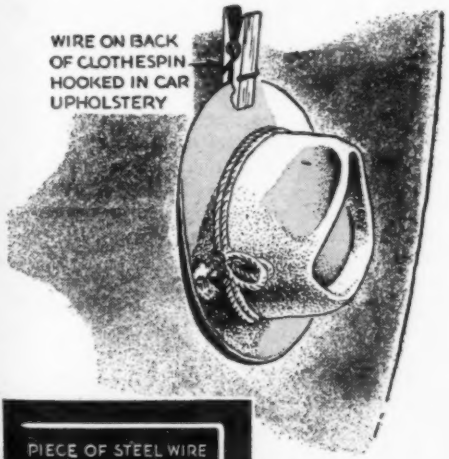

GREASE ON OUTSIDE
WRAP TOP OF SPARK PLUG AND WIRE, WITH PAPER TAPE
PRESS ASBESTOS PUTTY OVER PAPER COVERING
CAP CAN BE SLIPPED BACK ON WIRE TO GET AT PLUG
REMOVE PAPER AFTER PUTTY HAS HARDENED

Asbestos Putty Jackets Protect Sparkplugs

NEAT oil, water and heat proof jackets for sparkplugs can be made by wrapping plug and connection in paper, then covering whole with asbestos putty.—*A. H. W.*

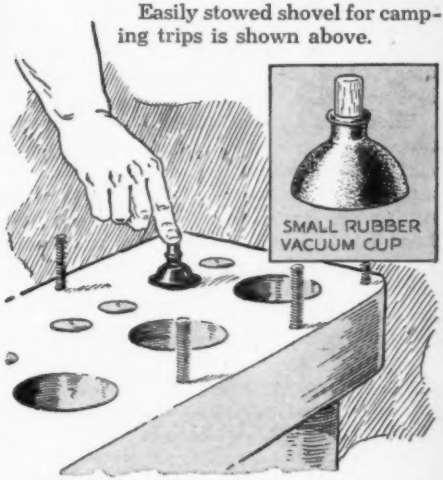
Stub Shovel For Car

Easily stowed shovel for camping trips is shown above.



Hat Hanger

AN ORDINARY spring clothespin rigged as shown at left is very handy for hanging hats and other articles safely in the car.—*A.H.W.*

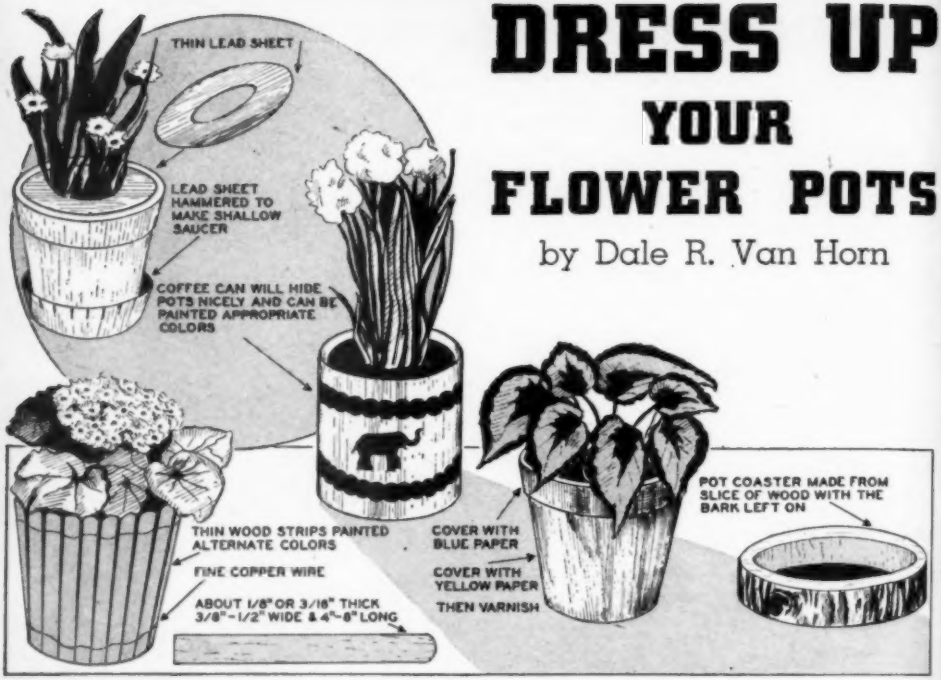


Vacuum Cup Tests Valves

THE quickest way to discover leaking valves is to press a rubber vacuum cup down over each one. The cup will stick over the tight ones but not over those that leak.

DRESS UP YOUR FLOWER POTS

by Dale R. Van Horn


THIN LEAD SHEET
LEAD SHEET HAMMERED TO MAKE SHALLOW SAUCER
COFFEE CAN WILL HIDE POTS NICELY AND CAN BE PAINTED APPROPRIATE COLORS
POT COASTER MADE FROM SLICE OF WOOD WITH THE BARK LEFT ON
THIN WOOD STRIPS PAINTED ALTERNATE COLORS
FINE COPPER WIRE
ABOUT 1/8" OR 3/16" THICK 3/8"-1/2" WIDE & 4"-8" LONG
COVER WITH BLUE PAPER
COVER WITH YELLOW PAPER
THEN VARNISH

DISTURBING potted plants is often unwise. It invites a setback and, occasionally kills them. The ordinary flower pot when brand new isn't bad to look at but as time goes on its bright tile color becomes dingy. Old pots with flowers in them don't look so well in the living room.

There are a lot of ways you can dress up flower pots. One of the simplest is to choose a good color and paint the pot as you would a box. If the paint is put on while the pot is dry on the outside it won't peel. Using two harmonious colors—one for the rim, the other for the body, is even better. Particularly if the colors are in keeping with the flower colors above.

Small picket fences are attractive for potted plants. The pickets are not unlike tongue depressers which are obtainable at the drug store. In fact for smaller pots, these are ideal and cost but little. They are laced together with small copper or stove wire, the bottom ends set tight together, the tops spread enough to allow for the flare of the pot. Note that two wires are used at both the top and the bottom of the pieces. These pickets are then either painted all one suitable color or tint, or the colors are alternated. The pickets should rise perhaps half an inch above the pot top.

Another way is to cut disks of rather thin sheet lead to fit just inside the top of the pot. A hole in the center is cut for the plant and the disk of course placed when the plant is quite small. This lead disk hides the earth and retards evaporation. Another use for these lead disks is to cut them to the right size (a pair of shears trims them quite easily) then hammer them into shallow saucers in which the pots are set. If the edges are rather violently crimped, so much the better, and they prevent excess moisture from seeping down through the hole in the pot bottom and staining the window sill or table.

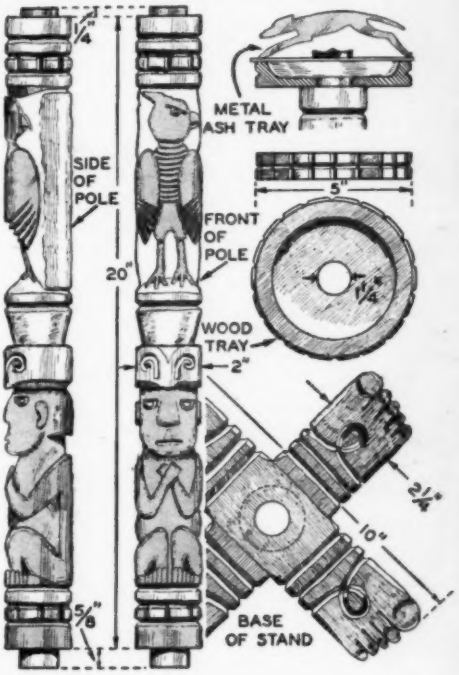
Two-pound coffee cans undergo a lovely transformation in the hands of one at all adept with the brush. There is no end to the variety of designs and colors. As a rule the design should not be gaudy or too complicated. The can should be rinsed out with a paint or varnish to prevent rusting on the inside.

Coasters for potted plants can be made in the lathe by sawing off slabs of wood from the end of pieces of firewood and turning a shallow depression in the top side to take the pot. The bark is left on and the piece *dipped* in shellac or varnish to fill all pores and prevent checking.

TOTEM POLE SMOKING STAND

THIS hand carved smoking stand makes a nice gift that will be appreciated in any home. It is really not hard to make although it looks difficult at first. All of the carving is done with an ordinary pocket knife. The entire length of the pole is 21-in. The carved portion is 20-in. long and a tenon is left at top and bottom. These tenons are used for attaching the wood tray at the top and the base at the bottom. Any characters can be carved on the pole that may be desired. The Indians usually chose forms of birds, animals and grotesque human figures.

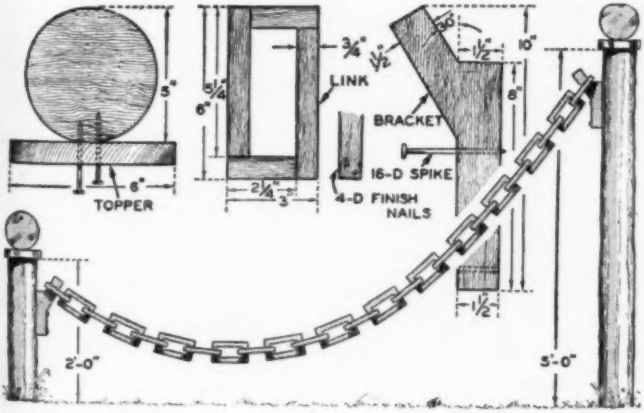
The base is made of cross boards, as shown. These are carved to resemble feet at the outer ends. The round wood tray at the top is dished out to receive a metal ash tray that can be purchased in any ten-cent store. The metal tray simply sets in the wood tray and is lifted out to empty. The edge of the wood tray is notched as shown for decoration. Base and tray are nailed to the pole around the tenons with small nails. Soft wood is easy to carve and is best to use. Do not use any sandpaper or do any scraping for the chipped effect of the knife work gives the proper finish to all parts of the stand.

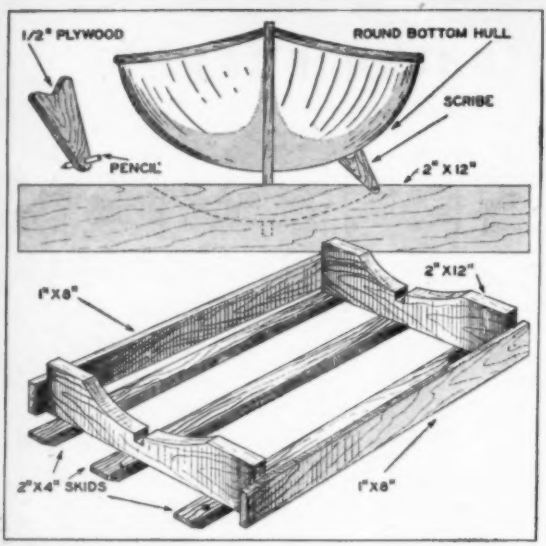


WOOD CHAIN LAWN FIXTURE

TWO pieces of wood chain about nine feet long and three ordinary cedar fence posts are needed to make this attractive lawn fixture. It can be used in many different ways to ornament your lawn. The posts should measure 4-in. across at the top and seven feet long. One of the posts is cut in two at the center to make the two short outer posts. These are set 18-in. in the ground which will leave two feet projecting above the surface.

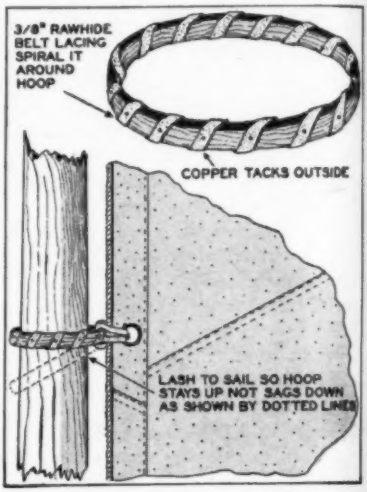
The wood chain is made of 1-in. material. A board 6-in. wide and six feet long is required for each chain. The boards are ripped into six strips which will be about ¾-in. wide. These strips are then cut up into short pieces. There are twenty-five links in each chain so fifty pieces will be needed for each chain. A gauge must be used for cutting these short pieces for they must be cut accurately to come out right. Two finishing nails are used at each corner of the links. Holes must be drilled for the nails to prevent splitting. [*Continued on page* 145]





Cradle For Small, Round-Bottom Hull

WITH the scribe shown, at left, it is possible to mark two-by-twelve planks to conform to the bottom of a round hull, from which planks a cradle is then built as suggested.—*H. S.*


3/8" RAWHIDE BELT LACING SPIRAL IT AROUND HOOP
COPPER TACKS OUTSIDE
LASH TO SAIL SO HOOP STAYS UP NOT SAGS DOWN AS SHOWN BY DOTTED LINES

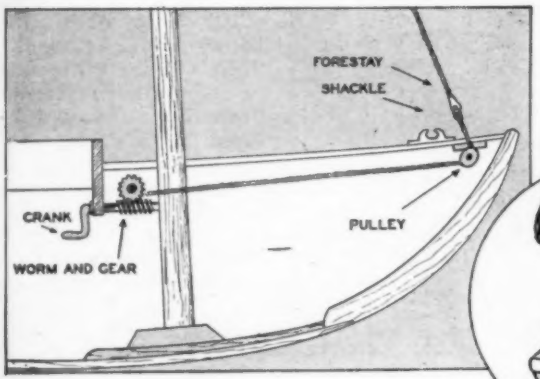
Cure For Chafing Mast Hoops

ALTHOUGH painted masts are becoming more popular than varnished ones the owner of a gaff-rigged boat often hesitates to paint his mast because he knows the hoops will chafe the paint off in unsightly patches. With varnish such bare spots are not as apparent. Chafe can be prevented by using ordinary ⅜-inch rawhide belt lacing, spiralling it around the hoop as shown and holding it by driving an occasional copper tack through it from the outside into the wood. This naturally decreases the inside diameter of the hoop slightly but any tendency to bind is counteracted by the greasiness of the rawhide. The hoops should also be lashed securely to the bolt rope or luff of the sail to prevent their sticking when raising or lowering it.—*J. E.*

KINKS FOR

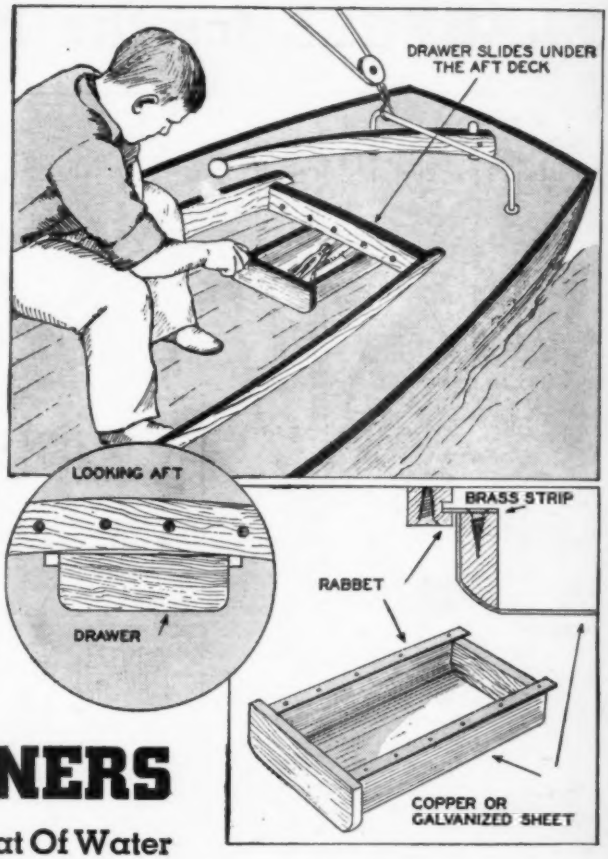
Forestay Adjustable From Cockpit

MANY times, especially during races, it is necessary to adjust the fore or jibstay, and if this can be done from the cockpit the problem is greatly simplified. The rig shown here is very effective. The stay goes through a plate at the bow, then through a block attached to the underside of the deck, and aft to a small winch, worm driven by a crank in the forward end of the cockpit. Thus it is easy to adjust the stay, even when alone.—*H. S.*



Tool Drawer For Small Sailboats

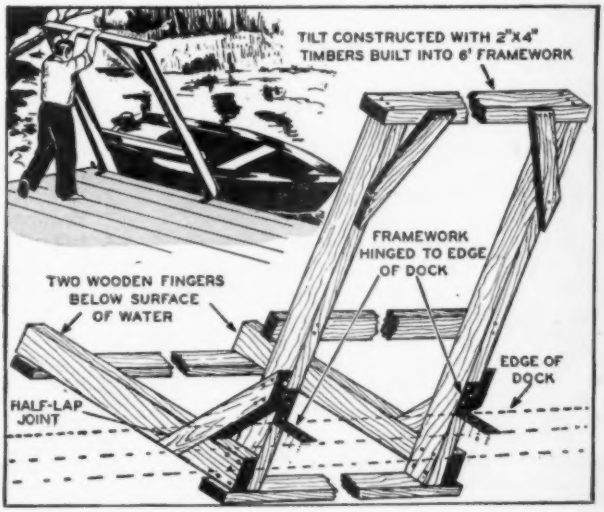
THERE is frequent need for pliers, knife, screwdriver and other small hand tools on a sailboat, and a convenient place to keep them all together is a necessity. This ingenious drawer, which slides out of sight and out of the way under the after deck will hold an ample supply of tools, and can be made and installed in a jiffy. A frame is made as shown of hardwood, the sheet metal bottom bent around it, with a flange at the top, and fastened to it with wood screws. The front of the drawer should overlap at the bottom to form a pull. The drawer slides are also of hardwood, screwed to the underside of the deck and rabbeted for the drawer flange. Because of its position, the drawer will not spill out, regardless of the boat's motion.—*H. S.*



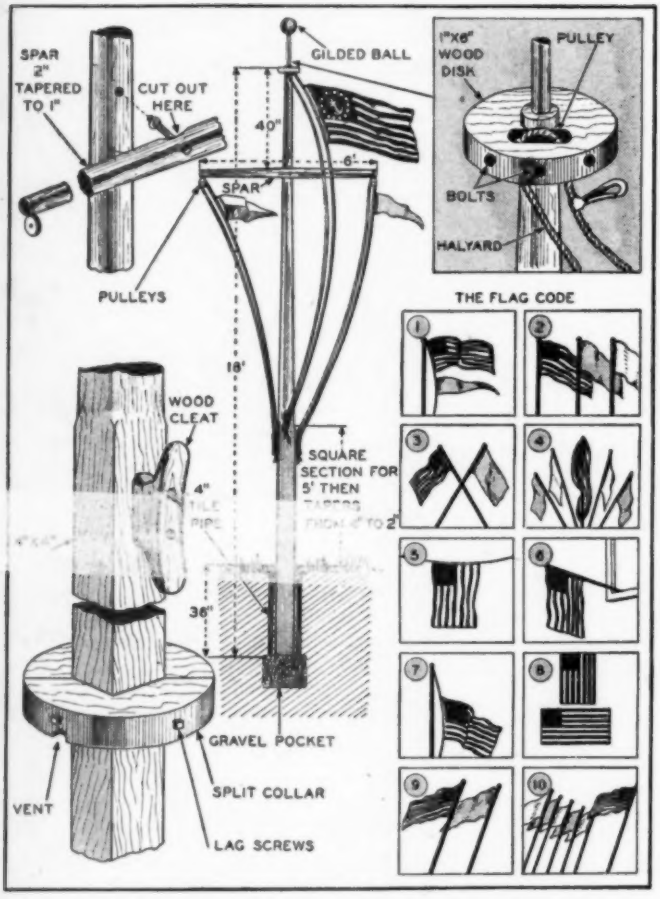
BOAT OWNERS

Tilt Quickly Drains Boat Of Water

THE back-breaking labor of pulling boats up on shore and hand-turning them over to drain out seepage has given way to an efficient mechanical boat tilt which even a youngster can operate. The tilt consists of two-by-four timbers built into a six-foot framework hinged along the edge of the dock. Extending below the surface of the water are two wooden "fingers" over which the boat is floated. Normally, the framework remains vertical with the fingers submerged. Pulling down on the framework causes the fingers to lift the boat out of water, tilting it over on its side for draining. —*O. I. S.*


TILT CONSTRUCTED WITH 2"X4" TIMBERS BUILT INTO 6' FRAMEWORK
FRAMEWORK HINGED TO EDGE OF DOCK
TWO WOODEN FINGERS BELOW SURFACE OF WATER
EDGE OF DOCK
HALF-LAP JOINT

FLAGPOLE for the Beach Home



ASIDE from its patriotic significance a well-proportioned flagpole greatly improves the appearance of a beach home or club. Here is a good model to copy, trimmed from a 21 ft., 4x4 spruce timber.

Leave the pole square for a distance of 8 ft. from the bottom, and then begin to taper to 2-in. square at the top. Use the same method as in trimming a spar; for instance, mark the taper with chalk on the full sized timber, cut with the rip saw on four sides, bevel the corners and finally round it with plane and sandpaper.

Cap with a 6-in. disk of wood having a sheave in a slot for the halyard. On top of this mount a gilded ball, as shown, or a copper wind vane. A 6-ft. spar is tapered toward the ends and secured with a single $\frac{5}{16}$-in. galvanized carriage bolt.

The foot of the pole may be creosoted and set directly in the soil, but a better way is to set in a section of drain tile, with gravel about a foot deep at the bottom. In the tile arrangement, the portion inserted should be rounded, or at least the corners beveled. A split collar of wood, ventilated by means of a groove on the underside, keeps out the rain. It will be well to paint the lower end thoroughly to forestall decay.

Wood or brass cleats are screwed to the pole as indicated. Give the entire assembly two or three coats of white yacht paint, so that the pole will stand out in contrast to the shrubbery.

The Flag Code

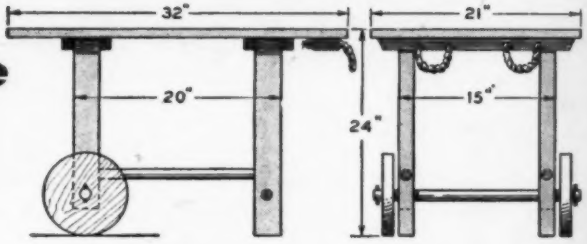
Following is the explanation of the flag code shown above:

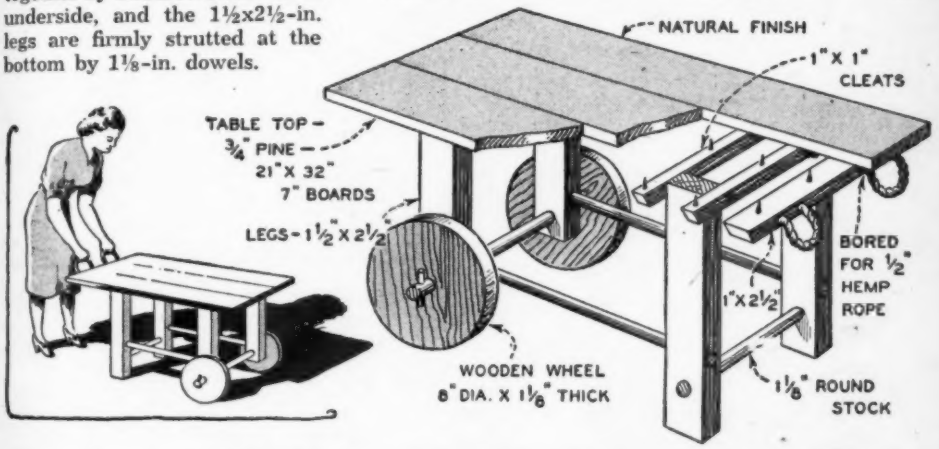
1. The National Flag should always be at the peak when other flags or pennants are on the same halyard.
2. When flags of two or more nations are displayed they should be on separate staffs of the same height, and the flags of equal size.
3. When displayed with another flag against the wall on crossed staffs, the National Flag should be on its own right, and its staff in front of, or over the other.
4. In a group of flags the National Flag should be in the center, or at the highest point.
5. When hung over the middle of the street it should be suspended vertically with the stars to the north in an east-west street; or to the east in a north-south street.
6. Displayed on a staff projecting from a

[*Continued on page* 144]

Roll-About Cocktail Table

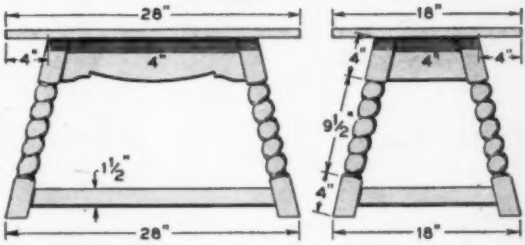
HERE is a profit project that can be easily turned out in quantity, the construction is so simple and the materials so inexpensive. The top is pine, held together by cleats screwed on the underside, and the 1½x2½-in. legs are firmly strutted at the bottom by 1⅛-in. dowels.

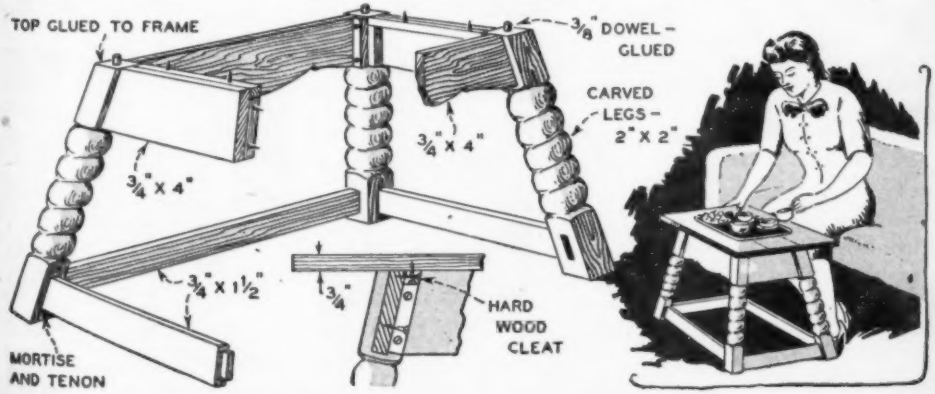


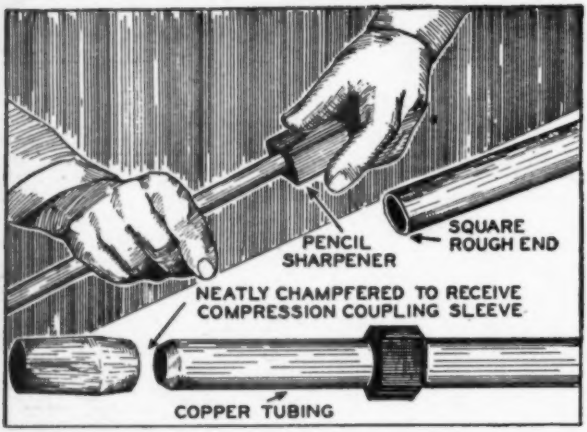

NATURAL FINISH
1" X 1" CLEATS
TABLE TOP – ¾" PINE – 21" X 32" 7" BOARDS
LEGS – 1½" X 2½"
BORED FOR ½" HEMP ROPE
1" X 2½"
WOODEN WHEEL 8" DIA. X 1⅛" THICK
1⅛" ROUND STOCK

Cordova Coffee Table Easy To Make

FOR the moderate amount of work involved this is an exceptionally attractive and useful piece of furniture. Construction is very sturdy throughout, making the table suitable for outdoor as well as indoor use. Legs are lathe-turned and assembled with cleats. Casein glue is used in all the assembly, and stretchers have mortise-and-tenon joints.—*Hi Sibley.*

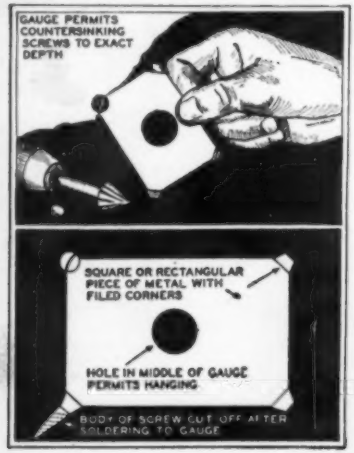






Pencil Sharpener Champfers Copper Tubing

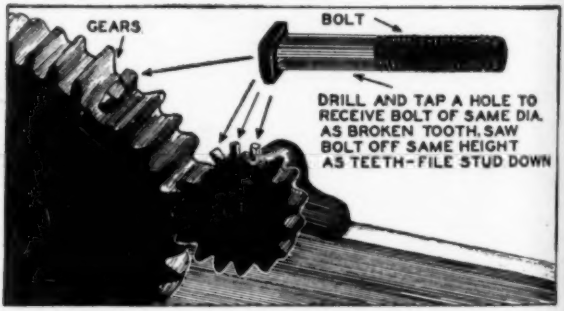
AFTER a piece of copper tubing has been cut it is usually a difficult job to file or champfer it evenly so that a compression coupling sleeve will fit neatly over the end. However, with an ordinary ten-cent pencil sharpener the problem becomes simple. Just slip the tube in the sharpener and turn it down as you would a pencil point.—*A. H. W.*


GAUGE PERMITS COUNTERSINKING SCREWS TO EXACT DEPTH
SQUARE OR RECTANGULAR PIECE OF METAL WITH FILED CORNERS
HOLE IN MIDDLE OF GAUGE PERMITS HANGING
BODY OF SCREW CUT OFF AFTER SOLDERING TO GAUGE

Gauge Countersinks Screws Exactly

THE little gauge shown here will eliminate all guess work in making countersinks for wood screw placement. With its use it will not be necessary to run a screw down after a cut has been made to determine whether it is of the proper size, only to have to remove the screw to make an additional cut. Simply apply the proper screw

[*Continued on page* 143]

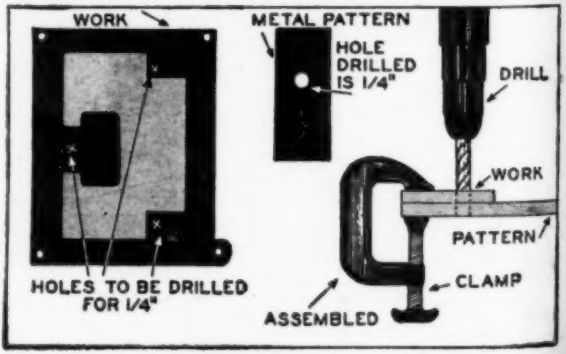


Repairing Gears

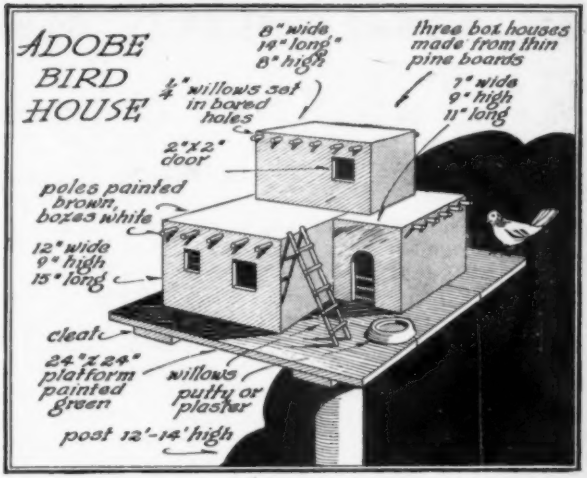
CAST iron gears which have broken teeth can be permanently repaired by substituting bolt studs for the missing teeth. In the space left by the broken tooth, drill and tap a hole, inserting a bolt, as shown.

For Accurate Drilling

WHEN it is necessary to drill a hole in wood or metal with precision, bore a hole the same size as you want in the work, in a piece of metal about ¼-in. thick.



Build An Adobe Bird House

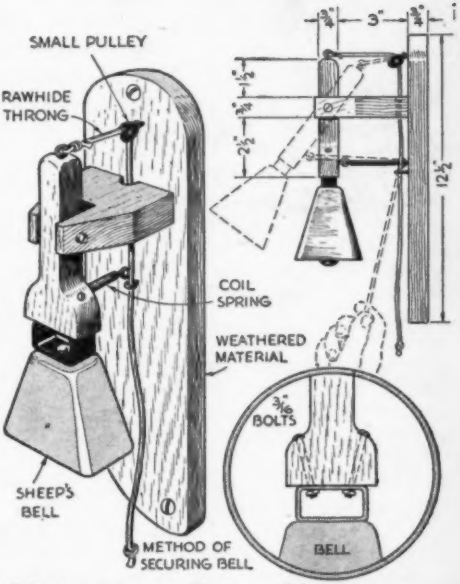

ADOBE BIRD HOUSE
8" wide 14" long 8" high
three bot houses made from thin pine boards
¼" willows set in bored holes
7" wide 9" high 11" long
2"X2" door
poles painted brown, boxes white
12" wide 9" high 15" long
cleat
24"x24" platform painted green
willows putty or plaster
post 12'-14' high

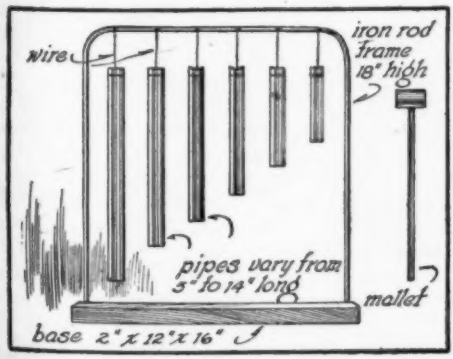
THIS attractive bird house is patterned after the adobe huts of the Southwestern Indians, and consists of three thin pine board boxes arranged as shown. Saw out thin boards from packing boxes, nailing them together to form the three boxes. Nail the boxes together so they fit tightly, the top and bottom boards fitting over the edges of the walls. Bore ¼-inch holes at 2-inch intervals along the upper edges of the boxes, near the top. In these holes drive pegs, 2-in. long, to get the rafter effect of the adobe houses. Nail the boxes to the platform to form a two-storied building, the second story being reached by a ladder made from ¼-in. sticks tacked to the bird house and platform at an angle. Cut a 2-by-2-in. opening in the top box for the door, and an arched opening in the front of the smaller box on the platform.

[*Continued on page* 144]

A Sheep's Bell For The Door

THIS sheep's bell announces callers in a pleasant tone, and can be heard to the far end of the house. It is mounted on a wooden bracket, with brass hardware where possible, to avoid rust. A weather-stained finish is attractive on the base, which is secured to the door frame with brass screws. The tension of the spring for best results is determined by experiment.—*H. S.*





Melodious Pipe Chimes

WHENEVER you get a section of bronze or brass pipe, keep it until you have a collection of six or eight pieces, ranging from 5 to 14-in. in length. Then make a stand from a plank and small iron rod, and hang the pipes from the rod to form a pipe chime set. Plane down the board to measure from 1¾ to 2-in. thick, 12-in. wide, and 16-in. long. Bevel the upper edges. At each end bore a

[*Continued on page* 144]

MINIATURE HOUSE AND GARDEN *Made Of Colored Showcard Board*

A MINIATURE house and garden of simple design can be made quite easily, in a few hours, of colored cardboard. The only materials required are a few pieces of show card board, a tube of model airplane cement, a bottle of India ink and some water color paints. For tools you will need a ruler and pencil, a triangle, a ruling pen, a small brush and a few single-edged razor blades. For this job it is best to use new blades which come four-for-ten-cents. The cardboard is regular showcard board which may be had at small cost in many beautiful colors and shades and also gold and silver. Full sheets are 28x44-in., but you can buy half or quarter sheets.

Showcard board, obtainable at art supply stores, comes in a great variety of beautiful pastel colors, costs but a few cents a sheet. With it you can construct this attractive house and garden. A convenient scale is given on the drawing, but you can build the set any size desired.

For the design given here you will need four colors—green, for the ground piece or lawn; brown, for the house base piece; white, for the wall pieces and chimney; and red, for the three roof pieces. Of course, you may use a different color scheme if you like.

This set is designed so all the front walks will line up when several houses are placed in a row. In time, if you keep busy, you will have a second row of houses, and placing a long strip of brown cardboard, to represent pavement, between them will complete your "street." Later on, if you keep going, you will have a colorful, miniature village which you may well be proud of.

No trees are used in these sets but they may be added if desired. If the two cuts shown in drawing are made on the ground piece the three units can be put together and held in a compact little bundle with two rubber bands. This feature allows a number of houses to be packed into a small box when not in use. (Put wads of crumpled paper between them.) These houses would go with miniature railroads.

The hardest part of making the sets is ruling on the windows, doors, etc., but with a little patience you will be able to do this. You will find that the ink takes nicely to this cardboard. As the plan shows, only ten pieces of cardboard are required and there are but "two" gluing flaps and ten bending cuts which are indicated by the letters "B-C." One set should be completed in five hours or less.

When you have all of the materials and tools mentioned ready, the first thing to do is to wash and dry your hands thoroughly because you cannot remove smears without leaving a spot on the colored surface. Art gum works fairly well to clean soiled areas.

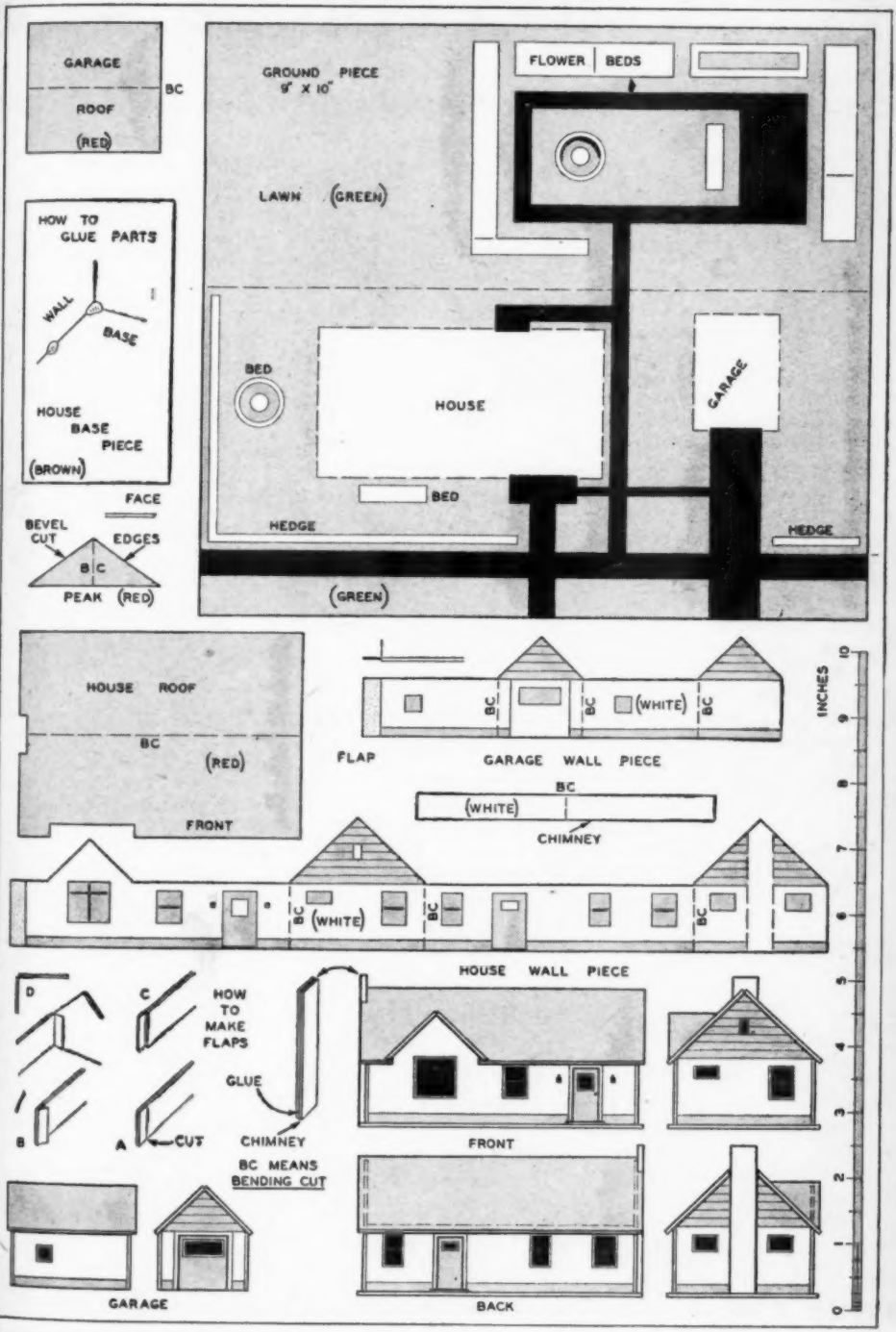
There is a kind of paper with lines spaced by ⅛-in. squares. The inch lines are printed heavier. If you can get this it will save you a lot of measuring and make the job of marking out the patterns much easier. If you can't—any white paper will do. Laying out on the cardboard does not work so well.

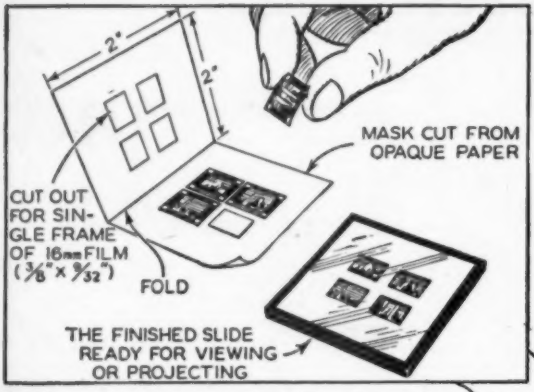
Cut a narrow strip of thin cardboard, lay it on the inch scale shown on the drawing page and with a sharp pencil mark all of the lines accurately and number the inches. This is your rule and laying it on the drawing will give you the measurement of any part or detail.

When you have all of the patterns marked out, lay them on a card, one at a time, and with a ruler and razor blade cut along the outside edges. Mark the name and color of parts on the patterns and also the "B-C" lines. This board is fourteen ply and to make a "bending cut" you must cut deep but leave a few layers to serve as a hinge. A shallow "B-C" will make a rough looking corner. Make a similar cut for the flaps—see "A" on drawing—peel off layers, shown at "B," so flap will look like "C." At "D" you can see how a flap looks from the inside when glued in place.

Now you are ready to cut out the parts. Place a pattern on the cardboard of the color designated, hold with hand or weight and pencil-mark all corners. Then, with a ball-headed pin, "stick" the corners of windows, doors and details. Remove pattern and line in with ruler and pencil. Carbon paper will cause trouble when inking in. With an old pair

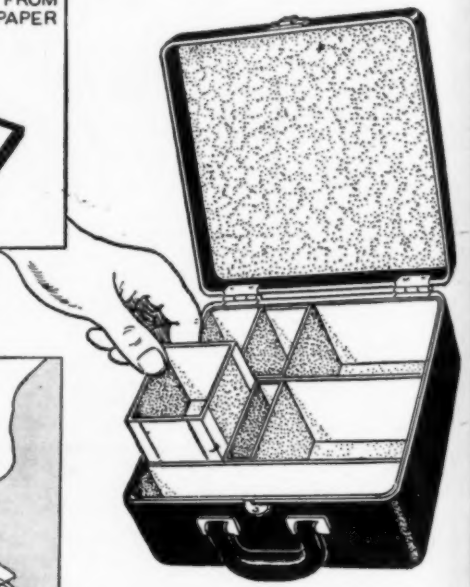
[*Continued on page* 145]

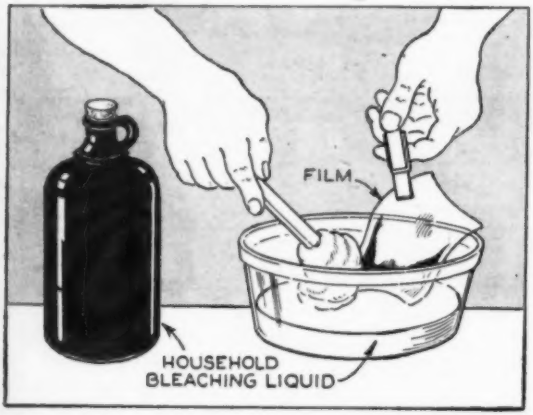

GARAGE
ROOF
(RED)
BC
GROUND PIECE
9" X 10"
FLOWER BEDS
LAWN (GREEN)
HOW TO GLUE PARTS
WALL
BASE
HOUSE BASE PIECE
(BROWN)
BED
HOUSE
GARAGE
BED
HEDGE
HEDGE
(GREEN)
FACE
BEVEL CUT
EDGES
B C
PEAK (RED)
HOUSE ROOF
BC
(RED)
FRONT
FLAP
BC
(WHITE)
BC
GARAGE WALL PIECE
BC
(WHITE)
CHIMNEY
INCHES
(WHITE)
HOUSE WALL PIECE
D
C
B
A
CUT
HOW TO MAKE FLAPS
GLUE
CHIMNEY
BC MEANS BENDING CUT
FRONT
BACK
GARAGE


2"
2"
MASK CUT FROM OPAQUE PAPER
CUT OUT FOR SINGLE FRAME OF 16mm FILM (3/8" × 9/32")
FOLD
THE FINISHED SLIDE READY FOR VIEWING OR PROJECTING

ABOVE: 16 MM FRAMES MOUNTED IN 35 MM FRAMES. A mask cut as shown from opaque paper and mounted in a glass slide can be used for viewing or projecting. Coat mask with rubber cement, put frames in place and seal mask.—*M. G. Winterton.*

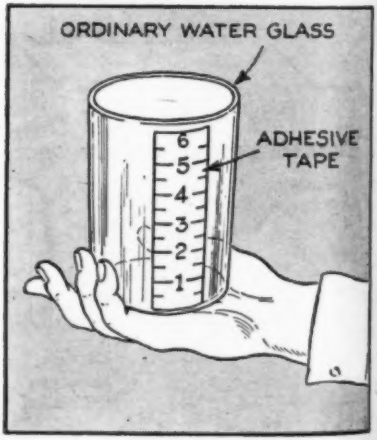
BELOW: SUITCASE MAKES PHOTO CARRYING CASE. This simple conversion can be made by constructing the compartments of cardboard. Each section should be made to size, as shown, and fit compactly. Extra compartments for various equipment can be made available for a change of accessories.—*L. Hochman.*

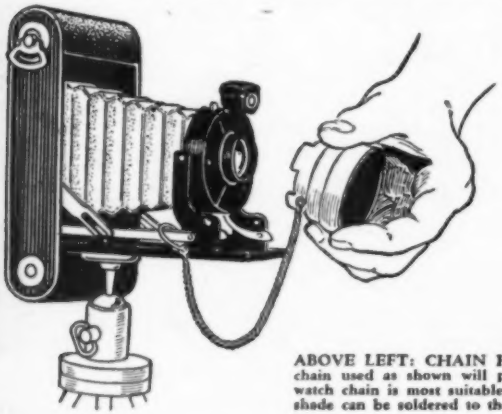




ABOVE: HOUSEHOLD BLEACH REMOVES FILM EMULSION. If you need clear celluloid, simply take old film and remove the emulsion by soaking in a strong household bleach such as Chlorox. Swab film with a rag on a stick.—*E. M. Love.*

BELOW: GRADUATE FROM DRINKING GLASS. Any inexpensive household or fruit-jar glass can be converted as shown. Simply measure the required quantities of water in a calibrated graduate and pour in glass. Now take adhesive tape and indicate the various levels.—*L. Hochman.*

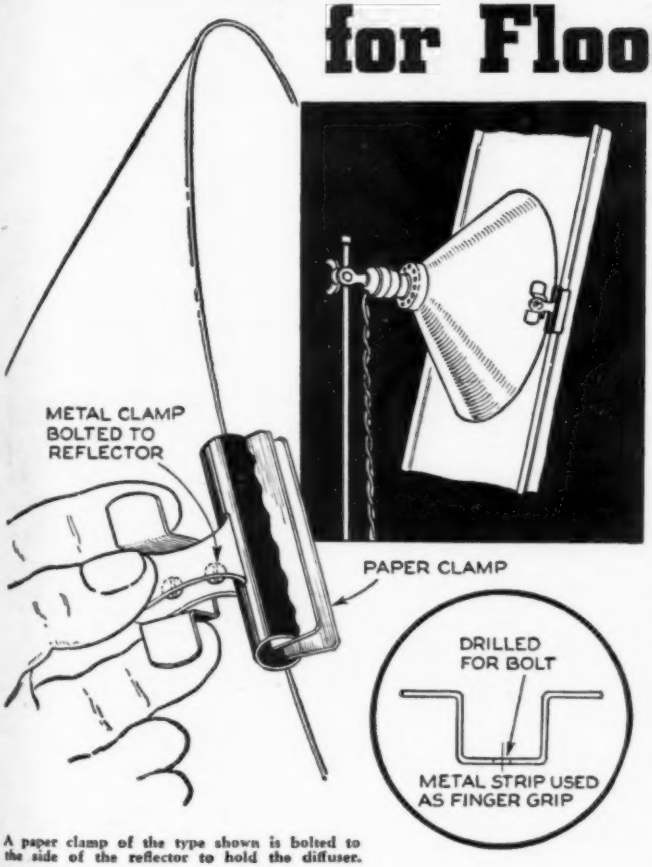




ABOVE LEFT: CHAIN HOLDS LENS SHADE. A small, fine chain used as shown will prevent loss of a slip-on lens shade. A watch chain is most suitable. A hook for attaching the chain to the shade can be soldered to the side of the shade.—*M. G. Winterton.*

Roll-Up Diffusers for Floodlights

by J. Modroch



A paper clamp of the type shown is bolted to the side of the reflector to hold the diffuser.

AN INEXPENSIVE, simple diffuser for use on any size reflector can be made with tracing cloth, a couple of dowel sticks and two paper clamps.

Adjustable for interchangeable use on reflectors of different sizes, the tracing-cloth diffuser can be compactly rolled up around the dowel sticks that serve as stretchers for the cloth.

When not in use, the diffuser can be rolled up, like a Chinese scroll, and put away. Thus half a dozen or more can be stored in an ordinary mailing tube or carried in the bottom of an ordinary lamp case.

The clamps, which are permanently mounted on each side of the reflectors, consist of a pair of large paper clamps at least an inch and a half long. They are bolted in place over metal strips bent to serve as finger grips. See drawing. The metal grips are screwed to the bottom "ear" of the clamp and then to the reflector.

By rolling in or out the extra slack in the cloth, the diffuser is adjusted to the reflector size. The diffuser can be slackened to belly out so that large bulbs projecting beyond the edge of the reflector can be accommodated.

Tracing cloth can be obtained from art supply and stationery stores. Of course, any suitable diffusion material that is flexible enough to be rolled can be substituted for the tracing cloth for this roll-up diffuser.

Amateurs will find this diffuser efficient and inexpensive as well as easy to make.

Simple Synchronizer Tester

IF YOUR synchronizer fails to operate correctly or if there is any doubt in your mind about it synchronizing perfectly with your camera shutter, here's a simple and inexpensive test. (It's not new, but photographers have a special knack for overlooking or forgetting the trick.)

Insert a reducing socket in the flash battery case. Then obtain a small bulb of flashlight size but of correct voltage according to the voltage of the batteries being used, and insert in the socket base. Now test to your heart's delight. Total cost: 20 cents. Result: Efficient synchronization.

AMATEUR PHOTO PUZZLERS

1. TRANSPOSING PICTURES ON LINEN

Q. I wish to transpose some of my pictures onto linen handkerchiefs. I understand there are several methods for doing this, but they advise using a "good" negative. The negative I wish to use is quite thin. Do you think it will work? Must the printing be done by daylight or could I use a photoflood bulb?—L. A. Cooley, Malden, Mass.

A. You can print pictures on linen and other materials by a recently described method (see reference in the bibliography below). It is not advisable to use a negative that is too thin or considerable loss of detail will result in the transposed picture. This is especially true inasmuch as the contact printing method used gives no opportunity for print control. It is all right to do the printing by artificial light, using a photoflood bulb.

2. PRINT QUALITY

Q. The quality of my enlargements is not very good. Would a diffusion glass and a stronger lamp in the lamphousing enable me to produce larger pictures?—E. M. Brown, East Moline, Ill.

A. A large light in the lamphousing and the use of a diffusion glass will affect the quality of your prints, but not their size. If you cannot get sharp prints or sufficiently big enlargements, you should check the following: (1) The focal length of the enlarger lens, which should not be shorter than the diagonal of the film. If a lens with too long a focal length is used, the size of the print will be limited. (2) A bulb of sufficient light intensity should be used to adequately project detail in the denser parts of the negative. A light that is too weak will result in a poor print. (3) The use of diffusion glass also helps improve the quality of the print. The glass serves to spread and soften the light, providing better distribution of light. If the enlargements are fuzzy, the fault lies in the focusing, which may be inaccurate, or in the lens, which may be of a poor quality. By correcting these conditions, good enlargements should result.

3. PAPER FOR FERROTYPING

Q. What kind of paper should be used for ferrotyping and how is it kept flat?—H. F. Nutter, Minneapolis, Minn.

A. Only paper marked "glossy" should be used for ferrotyping. Prints will remain flat if soaked, before ferrotyping, in a glycerine solution. Use a 10 per cent solution. You can also buy prepared solutions from photo dealers. These solutions are diluted with water and can be used repeatedly. Soak single weight paper about five minutes, then ferrotype them and they will remain flat.

4. FOCAL LENGTH OF CONDENSERS

Q. I intend using condensing lenses in the enlarger I am building from plans which appeared in your magazine. What should their focal length be? What happens if they are of an odd focal length?—James Toller, Berwyn, Ill.

A. The focal length of the condensing lens should be the same as that of the projection lens. A condensing lens of odd focal length can be used, but there is a loss of efficiency in transmitting light from the lamp housing. If too large, the condenser looses light; if too small, much of the light is unused.

5. TRICK PICTURES

Q. An article which appeared in your magazine stated that photographic pictures could be bleached out with a solution of mercury bichloride and that the pictures will reappear if held over cigarette smoke. I tried this trick but the image only partially appeared. Why?—S. Lobello, Toronto, Canada.

A. Your failure in bleaching the prints with mercury bichloride may possibly be due to an impurity of the chemical, although this seems doubtful. The most likely reason is that the prints were not entirely freed of hypo when they were washed.

The ammonia in tobacco smoke will cause the bleached prints to become visible in a brown color, and ammonia vapor as well as hypo will do the same thing. As the prints turned brown when you attempted to bleach them, it seems logical that a small quantity of hypo still remained in the emulsion.

6. SOME PHOTOGRAPHIC ABC's

Q. Please advise me on the following: (1) Can photographs be copied with a box camera, and how? (2) Is it safe to use outdated film? (3) Can red Cellophane be used as a safety mask? (4) How do 116 and 616 film differ? (5) Is it necessary to have running water in the darkroom? —Kenneth Abel, Ottumwa, Iowa.

A. Although it is possible to copy photographs with a camera lacking a ground glass, it is definitely inadvisable to attempt to do this with a box camera. In this instance, it is not only necessary to substitute a piece of ground glass in place of the film for the purpose of focusing, but you will also have to use an auxiliary front lens in order to get close enough to the picture you intend copying.

Outdated film can be used, but there is danger that it might be spoiled. If the film has been kept in a dark, cool and absolutely dry place, spoilage will not occur. But if the film has been subjected to moisture or a damp atmosphere, it will definitely spoil after a short time.

Red Cellophane can be used in place of a red gelatin filter as a window in your safelight, provided the density of the Cellophane is satisfactory. You can best determine this by holding a half-exposed sheet of printing paper to the light for several minutes. If the light is safe, the paper will develop clear all over. Otherwise it will develop half white and half grey.

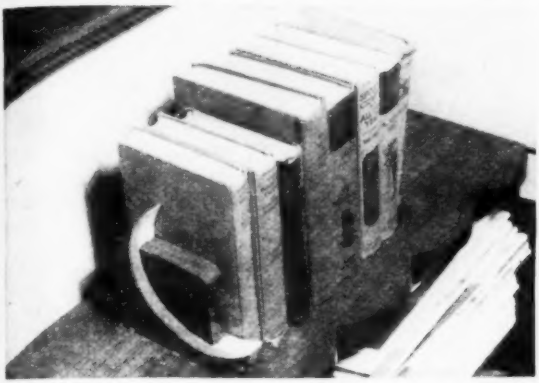
When film is referred to by number, the reference is only to its size. It is not necessary to have running water in your darkroom, although it is a decided convenience.

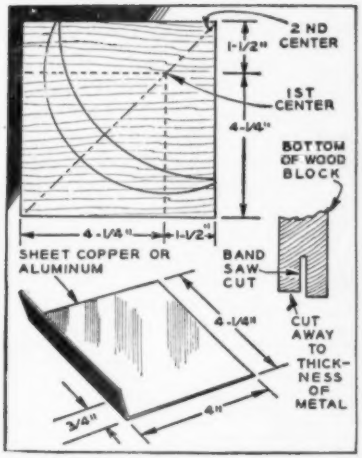
BIBLIOGRAPHY

Questions asked on this page have frequently been discussed at greater length in articles that have appeared in this magazine or in other publications published by Fawcett Publications. Henceforth, questions will be numbered. Corresponding numbers will be given below together with references to the articles, publications and page numbers in which the particular subject has been discussed, if at all. This will enable readers to compile an extensive and valuable reference library on photographic technique not otherwise possible. The reference publications are all available from Fawcett Publications, Inc., Greenwich, Conn., for 50 cents each, postpaid.

1. **Transposing Pictures on Linen. See "Pictures Without Paper," page 60, Photography Handbook No. 4.**
2. **Print Quality. No reference.**
3. **Paper for Ferrotyping. See "Ferrotyping Made Easy," page 102, Photography Handbook No. 5.**
4. **Focal Length of Lens. No reference.**
5. **Trick Pictures. See "Smoker's Trick Pictures," page 98, Photography Handbook No. 2.**
6. **Some Photographic ABC's. See "How to Make Copies," page 124, Photography Handbook No. 4.**

New Moon Bookends





The bookends in use, and construction sketch, above. Below: New moon shape is scratched into wood on lathe.

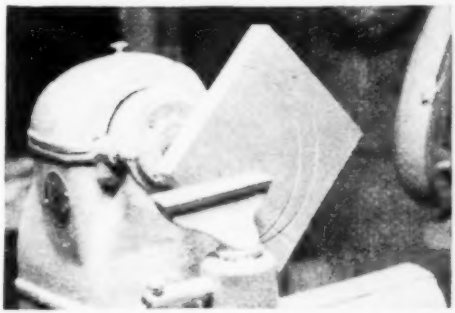
THE novel effect of these book ends is achieved by the design and also the two-toned treatment. Two blocks of wood, cut to the shape shown, are scratched on two centers spaced 1-in. apart, on the lathe to give the new moon outline. That's all the lathe work needed—just fairly deep V scratches or cuts with a skew.

Then with the band or jig saw, the blocks are sawed to shape and sanded. The final block is 4¼-in. square and each end of the moon projects past the top and side by 1½-in.

To get the two-toned effect, there are two methods. One is to use a light wood such as maple or pine or sap gum and stain all but the moon with either walnut or maple. The other is to use any wood and use two complimentary paint colors, painting the moon light and the background dark.

Stand the blocks on edge and make a band-saw cut along the center of the bottom of each, just up to the moon, or about ¾-in. Into this fits the turned up ¾-in. of one end of the copper or aluminum sheet used for the base proper. This sheet metal should be so chosen for thickness that it may be tapped to a snug fit in the saw cut, thus making no glue or cement necessary. And, to insure a neat appearance, cut away the inside half of the block bottom to form a recess for the sheet thickness and to permit the outside edge of each block to rest firmly on the table when in use. Finally, pad the inside surface of each block by gluing on a sheet of felt.

These bookends, because of their novelty, have good profit possibilities for the home craftsman. They can be made in numbers at low cost and will practically sell themselves.—*D. V. H.*



Fitting the sheet copper base into a slot in the bottom of the upright. Simple and attractive, these bookends can be finished in a couple of hours.

Your Job! Aviation Mechanic

[*Continued from page 73*]

mechanic in an automobile factory, you wouldn't be much happier doing similar but more exacting work in an airplane factory or airline repair shop.

"I'm only slightly interested in putting airplanes together, but I'm nuts about engines," you may be thinking. "What are my chances in that branch?"

Well, if you're qualified to forge ahead as a specialist in airplane power plants, you're plenty fortunate. Government officials have recently declared, in public statements, that motor production is the bottleneck which can conceivably hold down the output of planes. Motors simply cannot be shelled out like stampings from a power press. For some time to come you can be sure that every factory turning out airplane engines will be humming at top speed.

Very few airplane manufacturers make their own engines. These are delivered from engine factories ready for assembly in the ships on the production line. A certain number of motor experts are naturally required in the plant to supervise installation, but most of your engine specialists are concentrated in large motor manufacturing establishments, such as Wright and Pratt & Whitney.

To have a chance in such plants, your Aircraft Engine Mechanic's license is an absolute necessity. Employment standards are very high. Everything we have said about accuracy, thorough knowledge, and painstaking attention to detail goes double for engine work. You will be dealing with clearances of a ten-thousandth of an inch, inspecting, installing, and producing parts so carefully manufactured that they are perfectly interchangeable—a piston for a Cyclone, let us say, must fit perfectly into the cylinder of any Cyclone.

There you have a bird's-eye view of the field of aviation mechanics. Naturally there are small but important specialties which cannot be described within the limitations of a single article, but to recapitulate, your opportunities are, in general, these:

You can choose either to be a mechanic working on aircraft—the "chassis" of the plane exclusive of motor—or you can be an engine mechanic. Many men have both types of license. This naturally increases your chances. You can work either in an airplane factory, an engine factory, in an airline base or in air terminal repair shops.

Now, how are you going to get those government licenses with their requirements of a year's experience?

Well, you may be taken on as an apprentice by one of the large plants that is training its own men, as mentioned earlier in this article. As an apprentice you must figure on putting in at least two years of hard and probably dirty work at small pay while rolling up experience.

The C.A.A. project for training 100,000 private pilots (described in detail in April MECHANIX ILLUSTRATED) includes ground-school training which affords a good springboard into the mechanic's field if you wish to follow through. This training, plus 35 flying hours, costs you only $40, but in general you must be enrolled as a student in a college giving such courses to be eligible.

The Army and Navy give splendid mechanical training to men in the air services. The practical hazard here is that enlistment does not assure you of being assigned to the kind of work you want, for billets in the flying corps are choice plums shaken down by only the best qualified men.

You can, provided you land the job, work at an airport under the supervision of licensed mechanics and time built up there will be credited to you for license purposes.

There remains perhaps the most important and fastest method, that of taking a training course in a good aviation school. You can obtain a list of schools and their ratings by writing to the Civil Aeronautics Authority in Washington, D. C. Schools are rated only at their own request, and unrated schools are not necessarily inferior. The sensible procedure is to check over the catalogues of schools in which you are interested, noting the equipment and courses they offer, the type of instructors, their geographical location, possible factory affiliations, and other factors that may affect your decision.

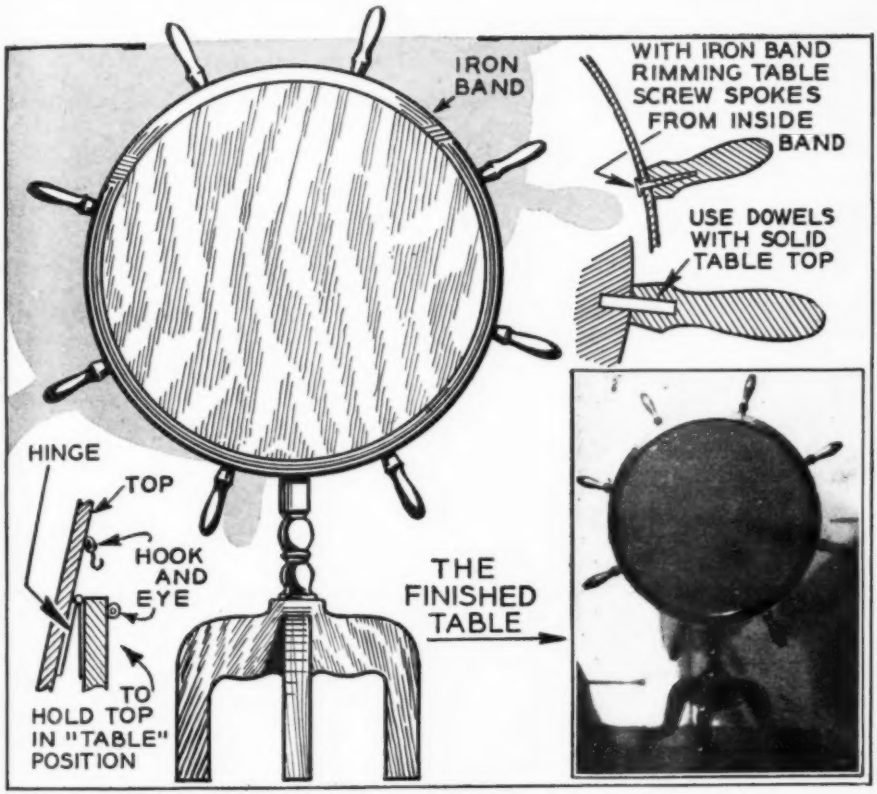
Correspondence courses in the mechanical field are also available and the instruction is of high caliber when given by reputable organizations. Book learning cannot take the place of practical experience in the type of work we are discussing, which involves skilled hand work and experience with actual mechanisms, but you must not lose sight of the fact that in taking your license examination you must pass a test on *theoretical* knowledge. A correspondence course, library reading, study of aviation textbooks, reading of blueprints—all these are excellent supplements to the practical training you may get working around ships at an airport.

A one-year airplane and engine mechanic's course at a residence school will cost from $500 to $800, with $600 perhaps representing a fair average. A master mechanic's course, fitting you for an airline job, runs about two years and costs in the neighborhood of $1,200. To these figures must be added your living expenses.

Money spent for such courses in a good school is well invested. Employers look favorably upon graduates of schools whose work they know. One of the first questions you will be asked is, "Where did you get your training?" Aside from company training, schools are the most reliable feeders of trained men into the industry.

[*Continued on page 122*]

Table For A Ship-Shape Room


IRON BAND
WITH IRON BAND RIMMING TABLE SCREW SPOKES FROM INSIDE BAND
USE DOWELS WITH SOLID TABLE TOP
HINGE
TOP
HOOK AND EYE
TO HOLD TOP IN "TABLE" POSITION
THE FINISHED TABLE

A simply made table of nautical design that will appeal to anyone with an eye for the usual.

THIS attractive occasional table is an easy project which utilizes parts of old furniture consigned to the junk pile; or you can make it entirely of new materials with few tools required.

As the table folds when not in use, its unique ship steering wheel design makes it an attractive decoration for a bare corner, at the same time taking up a minimum of space. The top may be left plain, with a high polish, or a colorful sailing ship billowing through white-capped waves can be painted on it to carry the nautical theme all the way.

The legs of the table in the photograph are from an old three-legged table which had been discarded. New legs can be made to the same design, or can consist of an upright 2x4 with a cross section base. They should be solid and heavy enough to support the top firmly when it is extended for use.

The top can be of any desired diameter. Attach it to the upright base with an ordinary ten-cent hinge. When the top is turned to a horizontal position, it is secured firmly in place with a simple china-closet catch. This catch can also be bought for about a dime. The table above has a top made from a discarded card table, encircled in a heavy steel hoop ¾-in. wide. The spokes of the ship wheel are screwed onto the metal band from the inside. If you make the top of solid wood, the spokes can be pegged in by means of ⅜-in. dowels.

The eight spokes are each 4-in. long and can be cut from the bottoms of old chair legs or turned on the lathe from broom stick handles or similar rounded wood. Finish by sandpapering and waxing.—*Dennis Coupe.*

Carving Himself A Future

[*Continued from page* 42]

he has been carving and traveling ever since. This lean, tanned youngster is decidedly handy with his Boy Scout ax and chunks of wood. He doesn't use a penknife any more, because he likes large, rugged effects. He uses a scooping motion that is misleadingly swift in its dextrous rhythm.

In Crescent City, California, Gruenke carved a 120-foot totem pole in two weeks. It should have taken forty-five days at least, so experts said. It is the tallest in the world. In the Sequoia Theatre, at Mill Valley, north of San Francisco, Ambrose carved a Popeye on the stage, during a Saturday matinee for children, in twenty minutes.

On the highway this carver appears like a cowhand out of a job. He wears riding boots and pants, a checked wool shirt and jacket and a wide-brimmed felt hat that has been on duty for a long time. He doesn't own a horse or a wardrobe—only a hand ax and newspaper clipping book. Most important of all, however, he owns the ability to create, and his creations will live through time.

At Grand Coulee Dam, he carved a replica of the great project out of fossil clay for Eleanor Roosevelt. The Fresno Y. M. C. A. has a wooden Indian, life size, that was hewn for the Friendly Indian unit. A bust was made for ex-Governor Charles Martin of Oregon. The Portland *News-Telegram* received a "Major Hoople." In Marshfield, two elephants and an Indian were sculptured for a ship's captain to take to Juneau, Alaska. In Palo Alto a newspaperwoman ordered a dog. In Saratoga, a four-foot steer and steer washer were made for a Dutch hotel owner. He was so enthusiastic that he had Gruenke carve him a mule with a dog on its back, a cat on the back of the dog and a rooster on the back of the cat. All heads, except that of the cat, were ingeniously made to move, and a nearby water line supplied the power.

In Merced, a cafe owner ordered some comic figures, including Olive Oyl, Sweet Pea, Wimpy, Mickey Mouse and Popeye. They were cleverly created from redwood and were advantageously displayed on the front of the building. Business became so brisk that the proprietor was tempted—and sold out.

The State Highway Patrol, in Eureka, was presented with a grizzly bear; in the same town a large salmon was ordered by the South Park Auto Court; at Newport, Oregon, an old buckaroo had a bust carved of himself. It was so prominently displayed and so complimentary that he was immediately besieged with feminine friends. A covered wagon and four oxen, all carved from a solid piece of wood, was presented to ex-Governor Frank Merriam. The Fresno Eagles Lodge wanted a Charley McCarthy to present to a new member. South of Crescent City, at "Trees of Mystery" Wonderland Park, Gruenke carved an Indian on a horse, "End of the Trail," life size. It took him three weeks and ordinarily should have taken two months.

This broad-shouldered, strong young artist is as friendly as he is capable. He has helped invalids, carpenters, painters, destitute mothers, business men searching about for sales, hitchhikers and in short, people everywhere. He trusts everybody and, amazingly, everybody trusts him in return.

As a consequence, he is hailed wherever he goes. "Well, if there isn't that Port Orford chiseler!"—"Hello, George—how's that cherry tree?"—"Gruenke, ax a few over on my place, come on, now!"

Blue eyes sparkle when asked what his ambitions are. He has a lot of them. When a mere stripling of eight years, he had a dream, one night, and he saw a beautifully carved home. That vision is with him still. He isn't making much money, and he doesn't want to, but someday he aims to own a truck and trailer. On it will be a huge redwood log and, rising out of it, Cinderella-like, will be a covered wagon, four oxen and walking figures. All of it will be carved from one big piece of wood. On side panels will be the hobby work of needy men and women and Ambrose plans to sell their creations for them. In each town that he passes through, half the proceeds from photographic postal cards will go to the local Boy Scouts, who will be the salesmen. Having taught carving to Scouts in Yosemite, Mariposa and Grass Valley, he is eager to further their training.

Wherever Gruenke is, he works in the wood indigenous with that locality. His ax has thumped against cedar, sugar pine, eucalyptus, palm and redwood. He says he likes palm and redwood a lot, because of the soft grain. But he isn't partial. He takes stumps, old flag poles, discarded logs and even standing trees and converts them into oddities and things of beauty.

Cross-Examining Minerals

[*Continued from page* 66]

specimens in the rough, cut, semi-finished and polished state.

Carson's "factory" occupies one end of his basement. It is laid out like the production line of a motor-car manufacturer. First there is the diamond saw for slicing rock, an abrasive wheel for knocking off rough edges and burrs, a lapping machine for grinding the sawed surface flat and removing saw marks, a buffing wheel for the first polishing operation, and a second buff for the final polishing.

The rock-slicing machine is of Carson's own design. He developed it himself because he wanted something that would run itself while he was busy doing something else. The cutting element is a thin steel disc whose edge is studded with diamond

[*Continued on page* 120]

BOOK BARGAINS FOR MEN!

50c

Here are four outstanding book bargains of great value to the practical man. Each of these handsome, lavishly-illustrated volumes will help you derive the maximum benefit from your workbench, hobby or sport. They are printed in rotogravure, 144 pages, expertly written and edited. These books are available at the surprisingly low price of only 50 cents, postpaid. Order yours today. Use the convenient coupon below or order by letter.

HOW TO BUILD IT—This *all-new* edition is packed with fascinating and useful home workshop projects, suitable for beginners and experts alike. Contains articles on woodworking and metal projects, radio, hammered copper ware, glass blowing, lamps, plaques, water skis, tennis table, sidewalk runabout, etc. Complete, detailed, simple specifications throughout. Illustrated, 144 pages, only 50 cents.

MODEL BUILDERS' HANDBOOK—Build your own model planes, boats, auto racers! *Model Builders' Handbook* contains complete, detailed plans for the construction of twenty-seven superb working models, plus articles on dozens of related subjects. Using these plans, you can easily build the Westland Lysander, a gas-powered flying-scale model of the famous British war plane; Slipstream Susy, super-streamlined auto racer; Yumping Yiminy, fast 27" powered speedboat, and others. Also special features on care and conditioning of model engines; how to make a model airplane wind tunnel; how to carve a propeller. Illustrated, 144 pages, only 50 cents.

PHOTOGRAPHY HANDBOOK (No. 5)—This is the latest edition of the most useful and practical of all photo publications. Every phase of amateur photography is covered in simple, entertaining style. You'll be able to take and develop better photographs after reading this excellent handbook. Darkroom addicts will be delighted with such articles as "New Twists on Distortion" and "Terrific Effects With Trick Photos." The "PH Dustmaster" Enlarger is a novel and efficient enlarger that you can build yourself. Dozens of ideas and practical suggestions for making better photographs; darkroom and studio helps; plans for camera accessories, etc., etc. Plus a thrilling and spectacular Picture Salon. Lavishly illustrated, 144 pages, only 50 cents.

HANDY MAN'S HOME MANUAL—This book will repay its cost many times over by telling you how to make countless repairs and improvements around the house without calling in professional help. Full of easy how-to-make, how-to-repair, and how-to-improve kinks. Simple plans for building useful equipment such as gates, garden furniture, kitchen cabinets, etc. Ideas for improving and repairing home heating plant, window screens, doors. Hundreds of other valuable tips for the handy householder. Illustrated, 144 pages, only 50 cents.

------CUT OUT AND MAIL TODAY!------

FAWCETT PUBLICATIONS, INC. MI-5
Greenwich, Conn.

Enclosed find money order, check or stamps (no coins). Please send me, postpaid, the book (s) I have checked below, at 50 cents each.

☐ PHOTO HANDBOOK (No. 5) ☐ MODEL BUILDERS' HANDBOOK
☐ HANDY MAN'S HOME MANUAL ☐ HOW TO BUILD IT

Name .....

Address .....

City ..... State .....

(Note: If you do not wish to cut this page, you may order by letter. Be sure to enclose full address and remittance.)

Baden Branch Library
8316 N. Broadway

Cross-Examining Minerals

[*Continued from page 118*]

particles forced into the metal. It would not be difficult for him to make his own discs, but he finds it more convenient to buy them.

In working out a holding device for irregular pieces of rock, Carson made an adaption of the old German vise (as used on the Schnitzelbank for holding barrel staves, etc., while being worked with a draw-knife). The piece of mineral rests on a slotted platform, and a length of 1-inch plank also slotted to receive the saw blade, is forced down on it by a heavy bolt and nut. The springiness of the board provides the necessary tension and flexibility. The clamping arrangement is part of a crane-like device that is slung by pulleys from two 1-inch steel rods. The specimen is fed against the cutting wheel by means of a rope-and-pulley system and several window-sash weights. With this machine and a cutting wheel in good condition, Carson can slice the hardest rock faster than a machinist could cut through a similar-sized piece of steel with a power hacksaw. The cutting wheel runs in a bath consisting of a mixture of equal parts of kerosene and lubricating oil.

Usually the saw does not cut completely through the rock, and Carson uses an ordinary grinding wheel to remove the burr formed where the halves break apart. After this is done, he moves the work to the next piece of equipment in his production line, a horizontal-wheeled lapping machine. The laps are made of cast iron or soft steel, and are charged with carborundum or similar abrasive powders. Each rock specimen is ground with four sizes of abrasive particles of succeeding fineness. Carson says one of his most difficult problems is to keep the coarse-grained abrasives from getting on the finer lapping wheels. While he holds the piece of mineral against the revolving wheel, he feeds the wet cutting mixture with a brush. He buys these brushes by the dozen, for the bristles are rapidly worn away. Carson next buffs the specimen on a felt wheel charged with tripoli powder, and finally on a cloth wheel charged with a very fine aluminum oxide polishing powder. To keep up with "production," Carson has to keep on hand a considerable supply of abrasive grains and powders. Some of the finer polishing materials cost five to ten dollars a pound.

Carson doesn't know how many pieces of cut and polished fossils, stones and semi-precious minerals he has. They run into the hundreds. On the basis of weight, there probably is a ton of hobby material in his basement. In addition, he has given away or traded hundreds of pieces. Often a friend who visits the basement stone-laboratory is presented with a specimen of agate, sliced with the diamond saw while he watches.

Carson's hobby takes him outdoors, for he collects most of his material by searching it out himself, and shipping it back to Akron. He gets most of it from the Chocolate Mountains and the Mojave Desert in California. On his last expedition, he traveled for two months, with his wife and 12-year-old son Jack, through California, Wyoming. Oregon, Montana, Nevada, and Arizona, searching for promising stones. He and Jack, on one occasion, penetrated the Mojave Desert to a point 35 miles from a highway and 30 miles from water. Carson shipped 800 pounds of stones to Akron on that trip.

Carson has a partner, another mineral collector who lives on the West Coast and conducts a business of polishing and selling agate and other attractive pieces. Part of the production of the Akron basement factory is distributed through this outlet, although Carson's activities are mainly in the non-commercial pursuit of his hobby.

The pastime of collecting, cutting and polishing stones and fossils is, Carson says, a growing one. It is particularly popular west of the Mississippi, where there is an abundance of raw material.

Correct Answers to Quiz on Page 65

1. False	13. True
2. False	14. False
3. True	15. False
4. False	16. True
5. True	17. True
6. True	18. True
7. False	19. False
8. False	20. True
9. True	21. False
10. True	22. False
11. True	23. True
12. False	24. True

25. False

Attention, MI Readers!

We will pay $1 for each true-false statement which we find acceptable. Statements will not be acknowledged or returned. Address the Quiz Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York City.

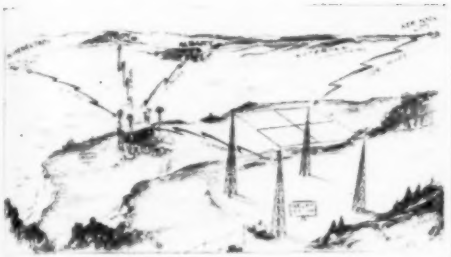
Checks have been sent to the following: Mrs. A. M. Hoose, Carlsbad, N. Mex.; James Sage, Clarence, Mo.; Mrs. Howard E. Farr, Marshalltown, Iowa.; E. R. Peterson, Chicago, Ill.; Andrew Fenda, Gilbert, Minn.; Louis Weber, Yeadon, Pa.; Gloria Dable, Olympia, Wash.; Jack E. Harris, Kansas City, Mo.; Thomas Gazley, Little Rock, Ark.; Edward Zimany, Chicopee Falls, Mass.; Roger Davies, Brewerton, N. Y.; Esther E. Holmes, Cincinnati, O.; George J. Petr, Lincoln, Nebr.; Arthur W. Alvey, Detroit, Michigan; Samuel H. Monella, Du Bois, Pa.

An average thunderstorm travels at a rate of 30 to 40 miles an hour.

The eighteenth century Swedish engineer Emanuel Swendenborg created descriptions and sketches of such devices as flying machines, the machine gun, and underwater craft.

Blue or Mississippi catfish of the sluggish streams in the Mississippi Valley and Gulf States sometimes attain a length of five feet.

Network Television Is Now A Reality



Network television, the dream of scientists for years, was demonstrated successfully to Federal Communications Commission members in Schenectady recently by General Electric engineers. The first demonstration of its kind in history, in which a program transmitted from New York was clearly received in Schenectady homes, 142 air line miles away, was made possible by the use of a new relay station working in conjunction with a main transmitter atop the Helderberg Mountains.

By the use of the new relaying equipment, located 1.2 miles from the main transmitter atop the Helderberg Mountains, 12 miles from Schenectady, television broadcasts from New York City will become available to Capital District residents within the range of the company's station W2XB.

The programs transmitted from New York City are received at the relay station on the 44-50 megacycle band by means of a rhombic antenna that resembles two diamonds placed end to end and supported by four 128-foot towers. The programs then pass through an amplifier, a part of the antenna structure, that increases the signal strength about 20 times before entering a wire line leading to the relay receiving station located beneath the antenna.

By means of a low-power 10-watt transmitter the picture part of the programs is then relayed on a carrier wave of 156-162 megacycles from a small transmitting antenna to the main Helderberg station. This transmitter is similar to the diamond-shaped one used to pick up the programs from New York but is only 10 feet across as compared with the 400 feet of the receiving antenna.

At the main transmitter a dipole antenna picks up the picture part of the relayed program and feeds it to the transmitter where the frequency is converted to the 66-72 megacycle level and amplified to 10 kilowatts.

The sound part of the program is relayed from the receiving station to the main transmitter by wire line. There it modulates a standard 10-kilowatt ultra-high-frequency transmitter, and the programs are then broadcast from two antennas above the transmitter to listeners in the Capital District.

MOTORCYCLING
GREATEST OF OUTDOOR SPORTS
See what fun and thrills motorcycle riders enjoy! Own a Harley-Davidson — take in club rallies, gypsy tours, races, hillclimbs—go on wonderful vacation trips at little cost. See your Harley-Davidson dealer NOW!
HARLEY-DAVIDSON
WORLD'S CHAMPION MOTORCYCLE
FREE
HARLEY-DAVIDSON MOTOR CO.
Dept. M1, Milwaukee, Wis.
Send FREE copy of big 24-page "Enthusiast" motorcycling magazine filled with pictures and stories of exciting motorcycle doings. Also literature on new 1940 Harley-Davidsons. Stamp enclosed for mailing cost.
Name
Address
SEND COUPON NOW

Hayden Branch Library
8316 N. Broadway

Your Job! Aviation Mechanic

[Continued from page 116]

It is no doubt obvious by now that you can't jump into this highly specialized game without training.

As in practically all mechanical fields, a liking for algebra, geometry, and trigonometry is a good indicator of aptitude. In a thousand and one ways, you'll use mathematics as an aviation mechanic. Preferably, you should also have taken, and completed creditably, courses in mechanical drawing and machine shop. You'll have to operate complex precision machines and reading blueprints is almost as necessary in an airplane plant as reading English.

Most airplane mechanics are members of a union whose wage scales are fairly representative of the industry. As a beginner you will start in at around 42 cents an hour, stepping up to 45 to 50 cents in your second year. Another year's experience brings you 50 to 60 cents; another year, 60 to 70; still another year, 80 cents.

Six years is allowed for reaching the grade of master mechanic, although advancements may come sooner at the option of your employer. This includes two years as apprentice. Completion of a thorough course at a school will naturally shorten this period. Nevertheless, it is fairly clear that you will have to devote several years to learning your stuff before you can hope to reach the top brackets. After you have reached the master mechanic grade, the path upward becomes tougher because of competition, with jobs as foreman, chief mechanic, etc., as the goal.

"Contact" is an important word in aviation, but in a different sense it is even more important in getting a job. The more airline employes you know, the more you get about in the industry, the more you impress your instructors, the more you talk with people in the field, the better your chances of hooking on to a job.

Recommendation by your training school is an important avenue to employment. If you are taken on as apprentice by a manufacturing company, and make good, advancement is assured. Personality qualities are vital; you simply have to impress a prospective employer with your dependability, loyalty, cooperation, energy. You will find employers more than willing to give you a hearing, but don't expect them to compromise on standards. You are really asking them to invest in you and you will find the men you hope to work with representing the very highest ethical standards without a mossback in a carload. As is the case with piloting, the aviation mechanic must have pride in his job and intelligence of a high order.

Certain types of experience are helpful in making the grade. Garage experience, if of a high type, is useful. Better yet is experience in an automobile engine plant where manufacturing methods are not greatly dissimilar from what you'll find in aviation.

Aviation mechanics can well be a stepping stone to getting flying experience, particularly if you connect with an airline or work around an airport. There are frequent opportunities to save up your dollars and buy flying hours at a reasonable rate, or to hit it off well with some friendly pilot who may take you under his wing. If you have already piled up some flying time, and have demonstrated your proficiency around airplanes, that may help to pry open a door or two for you.

However, your job as an aviation mechanic is an end in itself—and it's worth working for.

BALANCE SHEET
for assaying aviation mechanic's trade

ASSETS	LIABILITIES
Field is booming, should continue to grow	Employment centralized in large population centers
Technical progress will increase rather than decrease opportunities	Government licenses required before much progress can be made
Specially trained men are in demand	Training courses fairly expensive
Retirement for age reasons very unlikely	Hours often irregular; health must stand long hours working on feet
Income good	Two to six years required for skilled ratings
Government license is proof of your ability	Employment standards very high
	High school graduation a practical requisite
	Must sell yourself to employers; can't go into business for yourself or pick up much side money

Income Chart for AVIATION MECHANICS

Wages vary according to local conditions; these figures are averages which give a fair idea of the income to be expected from different classifications in the field.

Airplane and Engine Mechanic	per week, $35
Chief Mechanic	per week, $50
Mechanic's Helpers (with some experience)	per week, $25

The wages below are typical hour rates according to trade union classifications. Total income is usually higher because overtime work is one and one half times the regular hour scale.

Beginners, apprentices (for two years)	per hour, 42c to 45c
After year's experience following apprenticeship	per hour, 45c to 50c
After second year	per hour, 50c to 60c
After third year	per hour, 60c to 70c
Senior mechanics	per hour, 80c

British chemists are improving gas-proof paints, which must not be affected by mustard gas and must withstand de-contaminating processes following gas attack.

New Dams Will Produce Pure Metals In Northwest

Two metals, magnesium and manganese, not now plentifully used in their pure state by American industry, promise to be available at reasonable prices as the result of production of cheap electrical power by Grand Coulee and Bonneville dams in the Pacific Northwest. Promising deposits of ores of those metals occur in that region.

As a metal, magnesium has been known in the past as old-fashioned flashlight powder. But it is a true metal of the future because it weighs two-thirds as much as aluminum and less than one-fourth as much as steel, yet its alloys of extremely light weight have working properties similar to steel. Ultralight magnesium alloys promise to find extensive use in the construction of airplanes and automobiles, portable tools, and all sorts of machinery, furniture, novelties, etc., as soon as the price becomes less as it promises to do when hopes for its production in the Pacific Northwest are realized.

Processes for extracting metallic magnesium using cheap electrical power have been under development jointly by the State College of Washington and the U. S. Bureau of Mines at Pullman, Wash. From Washington magnesite, the magnesium metal can be produced by two different processes, one of which is similar to an Austrian process of direct carbon reduction the details of which are a closely guarded military secret. The cost of producing on a large scale of operation high-purity magnesium metal would be only 8 to 10 cents per pound compared with the selling price of about 28 to 30 cents per pound now in carload lots and $5 per pound in 1915.

High-purity metallic manganese, useful for steel alloying and the nonferrous alloy industry, can be produced from the high silica manganese ore of the state Washington's Olympic Peninsula. Already in pilot plant production at Boulder Dam by the U. S. Bureau of Mines, it has been estimated that commercial production on a large scale would see manganese metal at 7 to 9 cents per pound compared with the present 40 to 50 cents per pound.

High manganese alloys are reported to have a springiness unrivaled by any other metal, a vibration damping capacity more than 100 times that of steel. Copper alloys that can be hardened depend on a content of manganese for this property. Greatest use of pure manganese would be in making many alloy steels, to which manganese is already essential, without adding to them other elements such as carbon, aluminum and silicon, hitherto present in available forms of manganese.

An agricultural college is experimenting with a beet lifter—a vibrating device to lift sugar beets from the soil and loosen clods around them.

Botanists say that the earliest flowers of spring are also the most ancient and primitive.

SMOOTH-ON No. 1
dependable in repair work as water in making steam

SMOOTH-ON No. 1 derives its unequalled usefulness primarily from easy application, from quick setting into solidified iron, and from expansion in doing so. Where this last can be utilized with wedging action, as between the walls of a crack, under a clamped plate or between threads or flange faces, the combined adhesion and expansion into all voids, lock the solid metallic filling into place and produce lasting tightness. Leaks stopped with Smooth-On No. 1 are therefore *permanently* sealed, stripped threads can be made to hold perfectly, and loose nuts can be made to stay locked—all with minimum effort and at low cost. Smooth-On repairs also avoid the delay and expense for a professional mechanic.

The SMOOTH-ON HANDBOOK, filled with practical advice and information, explains all Smooth-On compositions and their uses, contains simple instructions with working diagrams for proper application under any conditions, and is a repair guide that every home owner and handy man should have. Study its contents and keep a can of Smooth-On in your work bench. You will then be prepared to stop many common nuisances and in case of a sudden leak or crack, you will have a life-saver.

Return the coupon for your copy of the booklet, and buy Smooth-On in 1¼-oz., 7-oz. or 1 or 5-lb. can from your hardware store or from us.

For your protection, insist on SMOOTH-ON.

Write for FREE BOOK

SMOOTH-ON MFG. CO.,
574 Communipaw Ave.,
Dept. 69,
Jersey City, N. J.

Please send Smooth-On Repair Book.

Name .....
Address .....
5-40 .....

Do it with **SMOOTH-ON**

Auburn Branch Library
5310 N. Broadway

25 YEARS OF
INDIAN FUN
STEPHEN W. MEADER, author of many adventure books, at the stern blade of his Old Town.
I've paddled my "Gray Goose" —18-foot Old Town Guides' Model—since 1914. Twenty-five years of canoe pleasure have cost me less than a cent a day. "Gray Goose" is truly Indian in design, but far stauncher, far steadier. —Stephen W. Meader
FREE CATALOG Own your own Old Town Canoe. Write for a free catalog that shows all kinds of canoes for paddling, sailing, and outboards. Also outboard boats, including big all-wood family boats, rowboats, dinghies. Write today. Address: Old Town Canoe Co., 665 Main Street, Old Town, Maine.
"Old Town Canoes"

FULL SIZE, CUT-TO-SHAPE
BOAT PATTERNS
blueprints, and complete specifications
Newest designs by naval architect. Cruisers, runabouts, sloops, snipe, outboard boats, sailing canoe (Kayak), etc., 7½ ft.-38 ft. Surprisingly low prices. Rush 10c (coin) for latest illust. catalog. Send $1 for "HOW TO BUILD BOATS" book, postpaid.
Cleveland Boat Blueprint Co., Station A-23, Cleveland, O.

WHY CHANGE OIL?
WHEN "OIL DOES NOT WEAR OUT"
— U. S. BUREAU OF STANDARDS
Car, Truck, Tractor Owners—Stop wasting your money on needless oil changes! Keep oil clean and "oily" indefinitely with "RECLAIMO" the heated super Filter-Refiner. Our *Free* booklet "Oil Facts" a revelation. Ask your dealer for a copy, or write to—
RECLAIMO MFG. COMPANY
2308 N. WESTERN AVE., DEPT. 33, CHICAGO, ILL.

MOTO-SCOOT
120 MILES PER GALLON
35 MILES PER HOUR
- 1½ H. P. motor
- Automatic two-speed drive
- Moto clutch
- Kick starter
- Automotive brakes
- Finger-tip control

Moto-Scoot's 1940 line brings you models applicable for practically every type of sport, transportation and delivery service. Travel up to 70 miles a day for less than 10c. Large, roomy package compartment for merchant delivery. Panels offer plenty of billboard space. Franchised territory available for dealerships to established firms only. Write for free descriptive literature.

A product of Moto-Scoot Manufacturing Company, 8468 South Chicago Avenue, Chicago, U. S. A.

Goodby To Radio Static

[*Continued from page 47*]

Another extraordinary feature of the Armstrong system is that a large number of stations may be operated on the same wavelength or frequency without causing interference, providing they are spaced apart 50 miles or so. The receiver simply selects the strongest signal and rejects all others. It will, that is, pick up one and only one station on each separate wave channel and reject all others just as if they did not exist. What a contrast to the situation in the standard broadcast band where stations a thousand or more miles apart interfere with each other!

This peculiar characteristic of frequency modulation suggests the possibility, if not the probability, of huge networks of low-powered, high-definition and static-free broadcast stations, each serving an area of 50 to 100 miles, and connected into chains by companion relay stations. That the plan is feasible and practical has already been proven by tests of this very nature. Moreover, it is a vital matter where chain broadcasting is concerned, as the usual wire lines are not capable of conducting the wide band of audible frequencies characteristic of high-definition broadcasting. Special cable for this purpose costs in the vicinity of $10,000 a mile, but a low-powered frequency modulation transmitter such as would be used as a key relay station for a number of broadcast stations in a given radius costs, complete, only $20,000!

Let it be said again that if it were not for Armstrong's determination, frequency modulation broadcasting might well have been shelved for good. Instead of taking defeat, he sunk $300,000 into the construction of the station mentioned in the opening of this article, and tooted its horn day in and day out until the radio field couldn't help but notice that something really remarkable was taking place in the air around New York. A mild ripple of interest grew into a wave of enthusiasm. Today, with television limping along on a flat tire, with no immediate destination, frequency modulation has the industry by the ears. It's unquestionably radio's new gold rush if one goes on nothing more than the avalanche of applications for station permits that have been and are pouring into the offices of the Federal Communications Commission. An orderly procession has turned into a stampede, and it is estimated that there will be one hundred frequency modulation stations on the air before the year is out.

Aside from Armstrong's station at Alpine, which serves as a part-time outlet for CBS, other such broadcasters are operating experimentally at Long Island City, N. Y., Schenectady, N. Y., Rochester, N. Y., Meriden, Conn., Springfield, Mass., Worcester, Mass., Milwaukee, Wis., and Washington, D. C. Many stations are under construction and many willl be on the air before this article reaches print. Applications have been filed by NBC, CBS

[*Continued on page 125*]

Goodby To Radio Static

[*Continued from page* 124]

and Mutual, and from Chicago, Los Angeles and San Francisco. A station at Paxton, Mass., serves Boston. The Yankee Network, in New England, is building a 50-kilowatt station at Alpine, right next to Armstrong's W2XMN, which will serve as a New York outlet for that chain. Mutual's WOR will also have a New York outlet, and it is reported that NBC will install a frequency modulation transmitter in the Empire State Building, with CBS more than likely following with a similar installation in the Chrysler Building.

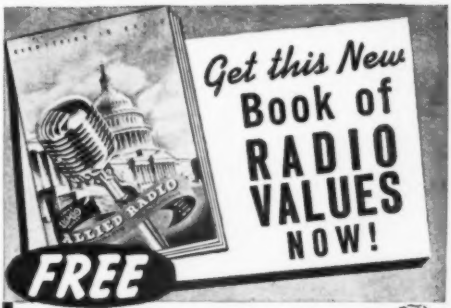
The pace is now too rapid to keep an adequate account of what is going on behind the scenes, but the curtain will rise this year and the show will be a big one, with John Q. Public in the front row taking it in with amazement.

Frequency modulation receivers are being marketed by General Electric and Stromberg-Carlson, with many other manufacturers to follow. The console receivers are designed to reproduce at the will of the listener either the conventional broadcasts or the frequency modulation variety. The table models are for frequency modulation reception only and cover a tuning range of 40 to 44 megacycles, in the vicinity of seven meters, where the stations are located. Stromberg-Carlson has a small converter model—actually a complete receiver in itself—which may be used in conjunction with any good console receiver of the conventional type. The converter has its own amplifier and loudspeaker for reproducing the very high audible frequencies, and a plug for insertion in the phonograph jack of the console set so that the amplifier and speaker in the latter may be used for reproducing the lower audible frequencies. There are two receiver kits on the market for those who wish to build their own.

Frequency-modulation broadcasting has the advantage over television in that no new technique is involved. It departs from the household necessity that broadcasting has become only to the extent that it is an improvement; in the same way that natural color motion pictures may be considered as an improvement over black and white films. You will still be able to hear your favorite programs, but with such fine definition that you will have the illusion that the stage has been set in your own room rather than in some distant studio.

The transition from the conventional system of broadcasting to that of frequency modulation will take time—some say a decade. It depends on the rapidity with which the public switches from one level of listening to another. Once a person has heard real high-definition broadcasting, the conventional broadcasts sound lifeless and they become increasingly more difficult to listen to. This fact alone may serve to complete the transition in a few years, for it is certain that people

[*Continued on page* 126]

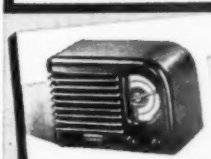


Get this New Book of RADIO VALUES NOW!

FREE

ALLIED—THE 100% RADIO HOUSE FOR EVERYTHING IN RADIO!

For more than 17 years, Dealers, Servicemen, Amateurs, P. A. Men and Builders have been depending on ALLIED for Everything in Radio at Lowest Prices! ALLIED is your Radio Headquarters for sets, parts, kits, tubes, P. A. systems, for more than 15,000 radio items. Get the Free New 172 page Spring Catalog NOW!



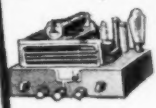
60 NEW RADIOS

See them all—1940 RADIO HITS! New "Camera" Portable—new European reception models—new "C o m pacts"—all types, all sizes, for every purse and purpose. Also new phonograph-radios, recorders, auto sets, "Ham" receivers—all at lowest prices in this new FREE Catalog!

NEW P.A. SYSTEMS

18 new Public Address Systems—7 to 75 watts—for Churches, Schools, Electioneering, Orchestras, etc. America's finest with latest features, at startling low prices. Easy Time Payment Plan. Complete accessory listing, recording equipment, etc. See them all!

MORE THAN 15,000 RADIO ITEMS! BIG MONEY-SAVING BARGAIN SECTION!



Learn Radio BUILD WITH ALLIED KITS

Dozens of brand-new exciting kits—new diagrams—new gadgets. Easy to build; low-cost. Build your own—learn Radio—it's a great hobby! Let ALLIED help you with Free Parts Lists and advice on how to build any radio circuit. Write us first—we'll be glad to help!

Send for RADIO BUILDER'S HANDBOOK—a beginner's book on radio; tells how to select circuits, read diagrams, build sets, etc. Easy to understand; illustrated; helpful. Order by coupon below. Only 10¢

CATALOG FREE Send this Coupon!

ALLIED RADIO

833 W. Jackson Blvd.
Chicago, Illinois
Dept. 6-E-0

☐ RUSH me your FREE 1940 Spring Radio Catalog.
☐ ENCLOSED FIND 10c. Send me your NEW Radio Builder's Handbook.

Name .....
Address .....
City ..... State .....

Baden Branch Library
8316 N. Broadway

IT'S *twice* the fun to handle an outboard motor that reverses! It's *twice* the fun to run quietly—with a real, built-in underwater exhaust. It's *twice* the fun to give 'er the gun with smooth, Perfected Alternate Firing! These are the "big 3" of outboard motoring and *only Johnson has all three!*

FREE HANDY CHART!

Write for the new Sea-Horse Handy Chart! Tells all about the 11 great models for 1940...two new Bantam Singles with 36% power increase ...Eight Perfected Alternate Firing twins...sensational new Hi-Power Twin... Prices as low as $49.50 f.o.b. factory

Available on easy budget payments.

JOHNSON MOTORS
200 Pershing Road, Waukegan, Illinois
Johnson Motors of Canada, Peterboro, Can.

15 MODELS! **EARN BIG MONEY!**

Solo, Tandem, Delivery, Ride-car—all featuring ALL STEEL frame, Automatic Gear Shift, clutch. WRITE!

Ride, Sell or Rent the NEW *Ranger* SCOOTER

Big money selling Mead's new power SCOOTER to stores needing quick, cheap, delivery—renting or selling to persons! Good territory still open but hurry! Write for EASY TERMS, Free Circular now!

Mead CYCLE CO. DEPT. E-3
CHICAGO—U.S.A.

GOOD PHOTOGRAPHY NO. 3

Here's a 144-page book full of worthwhile information for the person who wants to take better pictures. Contains articles by recognized authorities on the art of achieving beautiful and striking photographs. Printed in rotogravure and beautifully illustrated with salon prints, this book is something that no camera fan can afford to miss. 50 cents at your local newsstand, or postpaid from

Fawcett Building FAWCETT PUBLICATIONS, Inc. Greenwich, Conn.

Wood workers:

HERE'S Harold Hunt's new 1940 catalog! 136 pages; Latest, UP-TO-DATE IDEAS for experts and amateurs: — **SPECIAL BARGAINS** in rare woods, machines, and *all* kinds of supplies. — — Every woodworker NEEDS this new catalog. Send only 10c—now—to

only 10c

CRAFTSMAN'S WOOD SERVICE CO., Div. 2865
2729 S. Mary Street, Chicago

Goodby To Radio Static

[*Continued from page* 125]

living in localities where frequency-modulation stations are in operation, or contemplated, will buy only those receivers that will pick up both types of broadcasts, just as the public demanded—and was given—all-wave receivers when short-wave broadcasting became popular. And as the radio audience moves from the low- to the high-definition broadcast band, the advertisers will move along with them.

His Hobby Hit "Pay Dirt"

[*Continued from page* 52]

he was able to secure a contract from one of the world's largest oil refineries to build for them a scale model of their plant.

Since Mr. Kreuger's city is the nerve center of the oil industry, he has received commissions from other nationally-known companies to create models for them. This gave him the idea that perhaps others, especially the children of oil men, might be interested in model "cable tool" drilling outfits. He immediately began work on the idea. He drew his derricks to scale, from those popular with drillers. The scale was three-sixteenths of an inch to the foot and the models were made of bass wood. His first model was so perfect that it brought enthusiastic comment from every oil man that saw it.

His models include derrick, engine house, boilers and all other equipment common to the industry. His drilling rigs are so made that power may be applied and action, simulating actual drilling, is accomplished.

Orders began to come in so Mr. Kreuger found it necessary to make up this drilling equipment in kits. He is rapidly building up a demand for these kits nationally and many are sent from Tulsa to all parts of the world. Each kit has full-size drawing, making the assembling of a rig easily and quickly accomplished.

Imagine his surprise, however, when he found that most oil men wanted to build the derricks themselves rather than for their children to construct. Model railroad hobbyists also heard about the scale models and have ordered in quantities to build complete producing oil fields along their miniature right-of-ways.

Since the drilling for oil in the deeper areas has necessitated the shifting from "cable tools" to "rotary" equipment, Mr. Kreuger is now putting the final touches to his complete "rotary" kit. This kit contains material for the derrick, substructure, engine base, crown block, traveling block, swivel, turntable and draw-works.

A bit of ice in the mouth will numb the taste buds before taking bitter medicine, but remember—the back of the tongue is where bitter substances are tasted.

Aerial Photography

THE principle difficulty that is encountered in photographing from a plane is the blurring of the picture due to the motion of the plane with respect to the ground. Extremely high shutter speeds may be necessary in order to obtain a sharp picture. This is especially true if the plane is flying low and the camera is pointed almost directly downwards. In this case an exposure of 1/1000 of a second may be necessary to stop the motion.

Under most circumstances, say, when flying at 5,000 feet at 120 miles per hour, and directing the camera downwards at about 45°, a shutter speed of 1/200 of a second will be satisfactory. This applies to a camera of 5 inches. For small cameras, 1/100 of a second will give a sharp picture. Under ordinary flying conditions 1/50 of a second is about the longest exposure that can be used.

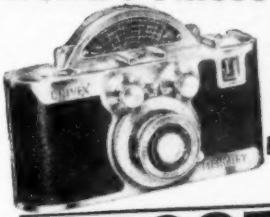
When taking pictures from the air, the atmospheric haze that is always present lessens the contrast between objects. The greater the altitude, the more pronounced this effect becomes. In order to increase contrast, filters are used which absorb the blue scattered light or haze. Those commonly used are the Aero 1, Aero 2, Minus Blue (12), and the red "A" filter. The deepest filter, that is the "A", gives the greatest increase in contrast. It also requires the greatest increase in exposure time. Therefore, the choice of the filter depends not only on the haze conditions, but on the shutter speed required to get a sharp picture, and on the speed of the lens.

It is easiest to take pictures from a cabin plane, shooting through the windows, but the camera should never be rested against any part of the plane, otherwise engine vibration will tend to cause a blurred picture. When working in an open ship, the high velocity of the wind makes it necessary to enclose the camera bellows to prevent its collapse. This can be done with fiber, or with light sheet metal, without much expense. The most interesting pictures can be obtained during the middle of the morning and the middle of the afternoon, when the shadows make ground objects stand out more strongly than they would if photographed during the middle of the day.

Oblique lighting also results in better detail and contrast.

India's population is expected to be 383,000,000 when the 1941 census is taken.

America's Challenge To World's Finest Cameras!



$29.75

EASY-PAYMENT TERMS AT MANY DEALERS

PROOF NOT CLAIMS!

October 4, 1939.

Universal Camera Corporation,
28 West 23rd Street,
New York, N. Y.

Gentlemen:

Our reports Nos. 149042, 149114, 149117 and 149799 contain results of tests of shutter speeds of specimen cameras selected at random by us. The sampling was made from dealers' stocks. The tests were to determine the average effective exposure time of the specimen cameras at various speed settings. The accompanying data correctly represent our measurements at the respective maximum speed settings.

Very truly yours,
ELECTRICAL TESTING LABORATORIES.
E. M. Grey, In charge of Photographic Laboratory.

Read Startling Truth About Shutter Speeds

Camera	Lens	Make	Claimed Speed	Actual Aver. Speed	List Price
UNIVEX MERCURY	f3.5	(American)	1/1000th sec.	1/1050th sec.	$29.75
CAMERA "A"	f2	(Foreign)	1/1250th sec.	1/1000th sec.	$285.
CAMERA "B"	f3.5	(Foreign)	1/700th sec.	1/350th sec.	$171.
CAMERA "C"	f3.5	(American)	1/300th sec.	1/145th sec.	$25.

Study the chart above! In view of these results, we invite you to COMPARE this sensational new Mercury with any speed camera retailing up to $200—in price . . . accuracy of shutter speed . . . performance . . . and results! Before you buy any Candid Camera, see the 1/1000 second UniveX Mercury at your dealer's today—or send coupon today for FREE illustrated booklet!

At only $29.75 the Mercury truly embodies every important feature of the most expensive foreign-made cameras! UniveX Cameras are 100% American-Made.

Universal Camera Corporation
Dept. M-71 New York, N. Y.

FREE

Please send me illustrated booklet describing the many features of new UniveX Mercury Super-Speed Camera.

Name _____

Address _____

City _____

Baden Branch Library
8316 N. Broadway

UNIVEX 1/1000th Second MERCURY

NEW SOUTH BEND *Precision* LATHES

$95.00 LESS MOTOR DRIVE

Send for Catalog

● 9" Workshop Back-Geared, Screw-Cutting Metal Working Lathe now in Model A Quick Change Gear and Model B Standard Change Gear with power cross feed, also Model C without power cross feed. 38 attachments for Mfg., Laboratory, Repair Shop.
OTHER SIZES: 9", 11", 13", 14½", 16" and 16-24" swing, bed lengths 3' to 12', motor drive and Countershaft drive.

SOUTH BEND LATHE WORKS
267 E. Madison St., South Bend, Ind., U. S. A.

FREE! Write for Catalog No. 46-B showing complete details of the new 9" lathe.

South Bend Lathe Works
267 E. Madison St.
South Bend, Ind., U. S. A.
Send Catalog No. 46-B Free, Postpaid

Name
Address
City 8316 N. Broadway State

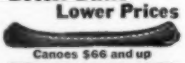
Extra POWERFUL, PERMANENT MAGNETS
Made From The New Alloy **ALNICO**

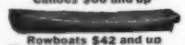
Newest aluminum, nickel and cobalt steel alloy. Horseshoe LIFTS MANY TIMES OWN WEIGHT. Useful, interesting and practical experiments. Set of 2 will permit experimentation with all properties of permanent magnets.
HORSESHOE—8 oz., $1.40; 4 Oz., $1.00. BARS—2 for $1.50
No C.O.D. or Stamps. Sent Postpaid. Catalog, 10c
HARRY ROSS Scientific & Laboratory Apparatus 66-70 W. Broadway, N. Y. C.

NEW TURN SIGNAL
FLASHES from REAR WINDOW—DASH Control
AGENTS A whirlwind seller. Drivers buy on flash demonstration. Dealers buy 3 to 12. Your profit mark-up as high as 264%. Biggest sensation of year. Rush name quick for facts and Demonstrator sample plan. All Free! Rush.
WATCH-MY-TURN SIGNAL CO., Dept. W-625, Walnut Bldg., Des Moines, Iowa

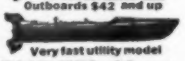
Thompson BEATS the World on BOATS

Better Built Lower Prices


Canoes $66 and up


Rowboats $42 and up

Outboards $42 and up


Very fast utility model

Safe Boats With Full Length Spray Rails
Keep passengers perfectly dry—even at high speeds. Catalog also shows today's five most popular models of sailboats. Two big factories. Prompt shipment.
CATALOG FREE
Write for your copy. State kind of boat in which you are interested.
THOMPSON BROS. BOAT MFG. CO. [91]
230 Ann St., PESHTIGO, WIS. (Write to either place) 130 Elm St., CORTLAND, N. Y.

Taking The Long Count

[*Continued from page 57*]

Harvard, the University of Alaska, and is a well-informed anthropologist. This year, he is working out from Fairbanks on snowshoes, enumerating miners and others holed up and isolated in the forbidding mountains bordering the Yukon River.

Back in the United States, an enumerator gathering facts in his district in the southern mountains entered a village store, where the mountain boys were gathered around the stove and enjoying themselves in good old hillbilly fashion.

"Morning, everybody," he announced. "I'm the official—"

But that was as far as he got. Just as soon as they heard that word "official," half the occupants of the store scrambled for their weapons, while a spokesman asked him:

"Mist' Official, air yew a-go-ing out o' this hyar place a-by yo'self, or air we a-go-ing to hev to bloody up the flo-or?"

The Census this year is going to be the biggest job of its kind ever undertaken. The official title of the current affair is the Sixteenth Decennial Census of the United States; it really comprises seven different census, each complete in itself and on a nation-wide basis. Facts and figures are already being gathered by enumerators under the Census of Business, the Census of Manufacturers, and the Census of Mines and Quarries. In April will begin the field work under the Census of Population, the Census of Housing, the Census of Agriculture, and the Census of Drainage and Irrigation.

Billions of questions will have been asked by the time all field work is ended. Thousands of new adventures will be written up for the Census enumerators. Just an idea of the immensity of their task is given in the following items:

Personal facts, some twenty-odd in all, will be reported for every one of the approximately 132,000,000 people in the United States; descriptions, covering some 30 features, will be written up concerning each of the 35,000,000 dwelling units (houses, apartments, tenements, etc.) in the country; about 135 questions will be asked each of the 7,000,000 American farmers or farm operators; 3,000,000 retail stores, wholesalers, and other business concerns, will be reported in minute detail as to their activities for 1939; 12,000 mines and quarries will be enumerated concerning production and other operations in 1939; factories and mills, 170,000 of them, will be "raw material" for a national study of manufactured goods and manufacturing in all its phases.

To collect all this information, some 120,000 trained enumerators will be in the field during April, while from 6,000 to 12,000 enumerators may work a few weeks longer to gather the loose ends of the economic census. It is estimated that the travels of Census men this year would take

[*Continued on page 129*]

Taking The Long Count

[*Continued from page* 128]

one man around the world at the equator nearly a thousand times (although why he'd want to do that is a dizzy stunt admittedly beyond us).

When the Census man calls on the average American, his questions will be fairly easily answered. He will ask the usual information about name, age, color, place of birth, citizenship, and the like. Then he will ask about the highest grade reached in school or college. For all persons 14 years old or more, he will ask about the number of weeks worked (on a full-time basis) in 1939, the kind of work, and actual amount of wages, salary, or commission earned in 1939. If the person is now unemployed, the enumerator will ask if he is seeking work.

The results of this inquiry will show the nation the *exact* status of the unemployed in the United States today. It will also reveal the exact money income of those who are at work and will indicate whether or not they are being paid a living wage.

Of course, the Bureau of the Census cannot show these facts or figures for individuals. They can be published only as statistics for the nation as a whole, and for states, cities, counties, and selected towns. Congress forbids the release of information that might be traced to any person or individual, and even other governmental agencies cannot examine Census reports until they have been prepared in statistical form. Census declarations cannot be used for taxation, regulation, or investigation.

Preparation of these statistics is a job of topmost magnitude. The Washington staff of the Census Bureau increases at decennial census time from a regular strength of about 800 to over 7,000. Many of these new employees are expert machine tabulators selected through Civil Service examinations given all over the United States. When the reports start to pour in from the field, they are grouped and tabulated as rapidly as possible, the machines running almost continuously at times through three shifts.

These Census machines, nearly all of which were especially developed and built by Census Bureau engineers expressly for Census tabulations, are more of those mechanical marvels which are "almost human" in operation. Facts from the Census schedules, or questionnaires, made up in the field are coded, then transferred by machine to punchcards. Other machines, passing these cards through at 400 or more per minute, are capable of performing supremely complex mathematical operations. One tabulator, for instance, can take all 45 items from 45-column cards, keeping each class of total separate from the others, and simultaneously keep on adding the forty-five groups virtually as long as an operator can keep new cards in the hopper.

Under average conditions, an automobile traveling 50 miles an hour cannot stop in less than 243 feet.

MAKE BIG MONEY
AT HOME *Electroplating!*

A Business of Your Own ... Plating Gold, Silver Copper, Nickel etc.

Automatic Equipment Makes Experience Unnecessary! *EASY AS PAINTING!*

NEW FIELD ... NEW PATENTED SYSTEM!

Warner's *simplified* 2-in-1 brush-and-tank system enables you to own *complete* Electroplating Plant at *unusually low cost.* Does same work as expensive, cumbersome outfits. Deposits layer of gold, silver, nickel, cadmium, copper by electrolysis. You do work guaranteed "Satisfactory or Money Back." *We teach you!*

A Permanent Business! Big profits at low prices bring you business from homes, offices, factories, jewelers, doctors, dentists, autoists, car dealers and most all store owners.

BIG PROFITS FIRST DAY! One hour practice starts you—*then earnings come fast.* Warner now makes possible replating of worn articles at a profit . . . *on untouched field!* Total capacity *$12,000 volume* per year—*year after year!*

AMAZING 2-MINUTE DEMONSTRATION

Draws Big Crowds and Gets the Business Send for details of *self-selling,* money-making plan and earning records of present operators. Learn how you can qualify for *Exclusive Franchise.* Get started right away in this profitable field. WRITE TODAY. *Just say:* "Send full details on new Warner System!"

WRITE AT ONCE

WARNER ELECTROPLATER CO.
360 No. Michigan Ave., Dept. 12-T Chicago, Ill.

FREE SAMPLE PROVES CLAIMS

NOW ONLY $4.95

REAL ENGINE VALUE

Over 7,000 GHQ Gas Engine Kits were sold at $8.50. Over 15,000 sold last year. Now is your chance to buy the *New Improved* kit for $4.95. Absolutely complete with coil, plug, etc. Send only $1. Shipped Exp. Coll. for balance same day. Send 6c for new 20 page illustrated hobby catalog.

DEALERS WANTED.

All Parts Guaranteed

½ H.P.— For Boats, Planes, Etc.

ALL PARTS FINISHED—ONLY A SCREWDRIVER NEEDED
AVERAGE ASSEMBLY TIME 30 MINUTES.

GHQ MOTORS, 40A East 21 St., New York, N. Y.

NOW A GENUINE EVINRUDE FOR ONLY $29.95

Prices F.O.B. Factory

EVINRUDE "MATE"

Weighs only 10 pounds

Costs only 2¢ an hr. to run

The lowest price . . . the biggest value . . . in Evinrude history! A smart and capable outboard offering all of Evinrude's famed features — Hooded Power — Co-Pilot steering — finger-tip controls — Underwater Silencing — trouble-proof Centrifugal Pump Cooling — extraordinary starting ease — a complete 1940 Evinrude for only $29.95! Fits any boat . . . a great motor for fishermen . . . runs all day on a gallon of fuel!

WRITE FOR 1940 CATALOG — FREE!

New catalog describes complete line of nine 1940 models, including sensational new 4-cylinder "Zephyr"—thrillingly smooth 4-cylinder performance with light weight and low cost. Also catalog of 1940 Elto models, with prices starting at $26.50. Write today. Address, EVINRUDE MOTORS, 4414 North 27th Street, Milwaukee, Wisconsin.

WANT A GOOD PAY JOB?

Trained Tool and Die Makers, precision machinists, automatic screw machine men earn as much as $50-$60 per week. Learn by actual work at one of America's best equipped shops. Training supervised by experts. Day-Evening classes. Enter anytime. Low fee, employment help. Write NOW for booklet "Practical Machine Shop Training."

FREE

ALLIED SCREW MACHINE CO., Inc. School Division

Dept. MH-5, 803-9 W. Lake Street, Chicago, Ill.

100X TELESCOPE LENS KIT $1.93

100 Power Complete Lens Kit

Make your own high powered telescope in one evening of easy work. All optical parts completely finished for 6 ft. long refracting telescope. Kit contains 3" diameter 75" F.L. ground and polished objective lens and 2 astronomical eyepieces 50X and 100X. See the mountains and craters on the moon, the ringed planet Saturn, the moons of Jupiter, double stars, etc. Complete kit with full directions for mounting at the special price of only $1.95 postpaid.

BROWNSCOPE CO., Dept. 75, 5 W. 27th St., New York

Saw-Filing

Pays Dollars for Spare Time

No Experience Needed

A FOLEY Saw Filer files hand, circular and band saws better than the best hand filer. Cash business, no canvassing, no overstrain. J. L. Newman, Louisiana, says: "I only use my Foley Filer for a side line, and I would say that I take in from $10.00 to $15.00 a week now." Send coupon for FREE PLAN, no obligation.

FOLEY MFG. CO., 517-40 Foley Bldg., Minneapolis, Minn.

Send Free Plan on Saw Filing business.

Name .....

Address .....

Duden Branch Library

8316 N. Broadway

Crabbing His Act

[*Continued from page 61*]

dumped them into three storage bins constructed in the shallows near the beach. In another bin were stored fish, which the brothers had caught by trolling and which were used as food for the prisoners with the pincers. A crab, Lew learned early, has little if any of the Rotarian spirit, and if he is not kept well supplied with groceries, he will proceed to devour his brother, or any other crab which seems slow in getting up its dukes.

Shipments are made once a week in boxes of 500. They travel alive, packed in fresh seaweed, and they even can go slow freight, since crustaceans can exist for several days without water. A shipment of 500 crabs will weigh in the neighborhood of 35 pounds.

In their fraternizing with crabs, the Bramers have learned a good deal. They have discovered, for example, that crabs are not above such tricks as adopting protective coloring to fool the unwary angler, and they also have learned that, while suckers, carp and other fish are excellent bill-of-fare for the crustaceans, the crawlers really look on fish eyes as the daintiest of tidbits.

A healthy crab will live for three years, they've learned; spawning occurs in June, and trapping gets better as the water grows colder. The rock crab, identified by a black spot on its back, is about the only member of the species not in great demand, and the trapper should not be surprised if he captures a freak crab or two, since the loss of a tail or a claw means nothing to a crustacean. He simply grows another portion of the missing member.

As to advice—well, the Bramers haven't much to give to prospective crabbers. The first thing to do is to find out if there *are* crabs to be caught in your community, then be sure to find out whether you have to have a license to catch them. There is no best depth, the boys say, for setting your traps, although they suggest your moving the snares often if the catch doesn't measure up. Another thing: If Mr. Crab takes it into his head to hang onto one of your fingers, Lew warns against your trying to pull the injured member away too quickly. If you do, the crab just gets a firmer grip. The idea is to push, not pull. The crab seems to understand this gesture and immediately sets you free.

And, if you're interested in eating one of your catches, you do it this way: Break off the tail and the claws, boil them in salt water till the shell covering turns red. Then peel, season and eat. As to whether they make good eating or not, Lew Bramer says he wouldn't know.

He has never eaten one.

Germany is buying up old phonograph records at the rate of 3,000,000 a year, as a source of much-needed shellac.

For Dogs Only!

[*Continued from page 87*]

on the ground, on edge. The lathes are then nailed to them. In similar fashion the other three panels are made, and the four sides are set up and joined by screen door hooks and screweyes. The resulting enclosure is light but strong, can be disassembled and moved around as desired.

A Dog Manger

This dog manger or feeding station is a dandy. Requiring a bit of metal spinning and simple wood construction, it can be made easily in an evening.

Mount a hardwood block (preferably maple) on the lathe head stock and turn it down to the size and shape shown in Fig. 12.

Mount a disc of 1/16-in. thick aluminum between this pattern and a block of wood centered against the tail stock center. The tail stock backing up block should be the same diameter as the flat portion of the bottom of the dish. And to hold the disc in place until forming has started, drive a small brad in the exact center until only the head protrudes. Make a small mark with a dull punch in the center of the stock, center this over the brad head and bring up the tail stock center until it is tight (Fig. 14). Spin the dish over the form, going through the steps slowly enough that ripples do not form. Keep the surface of the metal well greased with hard oil. Then cut off the waste and form a bead which can be quite large—say 3/16 or ¼-in. in diameter. Make another dish to the same size. Make the stand as shown in Fig. 11.

The dishes nest nicely in the holes, the beads preventing them from dropping through. This manger provides a dish for food and another for liquids. It is easily dismantled for cleaning, but most important, it keeps the dishes above the floor and even though water or food is spilled, it will quickly dry.

Covered Wagon "Dogbarrow" Beautifies Garden

This unique doghouse rests on two primitive wooden wheels, has a gay canopy and will be

[*Continued on page 152*]

P.W. RESETS BATHROOM FIXTURES

You can quickly and easily reset loose bathroom fixtures, loose tiles, seal unsightly cracks around bathtubs and sinks with waterproof Plastic Wood. At Paint, Hardware, 10¢ Stores.

PLASTIC WOOD

ANNOUNCING New Daisy 1000-SHOT RED RYDER CARBINE

New Daisy COWBOY CARBINE features: 16" Leather "Saddle Thong on genuine Western CARBINE RING! Golden Bands! Red Ryder BRAND on Pistol Grip Stock! 1000-Shot Repeater! Lightning-Loader Device! $2.95 at Dealers. If he hasn't it, send us $2.95. We'll mail Yours postpaid.
Write for FREE New Catalog
DAISY
DAISY AIR RIFLES
IT'S REALLY YOURS for only $2.95
DUTY ADDED IN CANADA
Daisy Mfg. Co. 565 Union St. Plymouth, Mich. U.S.A.

HERE'S WHY WE CAN AFFORD TO OFFER YOU . . .

20 SHAVES FREE

I NEVER HEARD A GUY RAVE SO! YOU'RE SURE SOLD ON LISTERINE SHAVING CREAM
YOU BET! THAT LITTLE 20-FREE SHAVE SAMPLE SOLD ME FOR LIFE!
WHAT LATHER! EVEN A USED BLADE WIPES MY WIRY BEARD AWAY NOW!—AND THERE ARE 24 QTS. OF LATHER IN THE REGULAR TUBE—
SEEMS TO GIVE YOU A SWELL, CLOSE SHAVE TOO—GUESS I'LL TRY IT!
THAT CREAM'S TOPS! SO COOL IT EVEN HAS THOSE TENDER-SKINNED SOUR-PUSSES AT THE CLUB SMILING FOR A CHANGE!
TELL 'EM ABOUT THE BRUSHLESS TOO—IT'S A HONEY!
TWO WEEKS LATER

CLIP THIS COUPON

Lambert Pharmacal Co., Dept. 178, St. Louis, Mo. Please send me free and postpaid your large sample tube of ☐ Listerine Shaving Cream; ☐ Listerine Brushless Cream. (Check whichever is desired.)

Name_____ Address_____

City_____ State_____

Baden Branch Library
8316 N. Broadway

Send for the 1940 Atlas Catalog showing Atlas Lathes with Power Cross Feed standard equipment—Drill Presses—Shapers—Arbor Presses—Vises, etc. Write today.

ATLAS PRESS CO., 562 N. Pitcher St. Kalamazoo, Mich.

NEW HORN INVENTION

Makes double horns yodel, single horn beep-beep-beep! Easy and fun to install. Makes any car distinctive, instantly recognized by sound of horn. Be first to have one. Money-back guarantee. Agents also invited to write. COD, money-order... **1.49**

LYDON-BRICHER MFG. CO.
3502 UNIVERSITY AVE., ST. PAUL, MINNESOTA

Catch Fish! Minnows, Eels, Mink, Muskrats, etc., in large numbers with our Folding Galvanized STEEL-WIRE TRAPS. They catch them like a fly-trap catches flies. Write for our FREE TRAP OFFER, bargain catalog. SURE LURE makes 'em bite day or night. New principle used, it coaxes fish. Put up in tubes 5 inches. Price 50c, 4 tubes for $1. Walton's Automatic Fish Hooks—3 for 50c.
Walton Supply Co., 3501-A Juniata St., St. Louis, Mo.

BUILD THIS ELECTRIC SCOOTER

FOR SPORT • SCHOOL • BUSINESS • DELIVERIES • RENTAL • SALE

ONLY 25¢ for PLANS

Easily done by following LeJay's New simplified plans. No transmission! No clutch! Suitable for sidewalk use. Noiseless electrical operation. Easily put together and taken care of at home. Enjoy the double pleasure of making and using this sensational LeJay Electric Scooter. Send 25c today and get started at once.

LeJay Mfg., 1714 LeJay Bldg., Minneapolis, Minn.

The smallest tube radio in the world. **SIZE ONLY** 3"x4½"x1¼" **COMPLETE WITH SELF CONTAINED BATTERIES!** Wt. only 15 ozs. Fits easily in any pocket. Use it everywhere you go. Receives distant broadcast stations and will **BROADCAST** your voice and music to any ordinary radio hundreds of feet away! No changes or plug-ins! Two or more **"TINYDYNES"** make a complete **"WIRELESS PHONE"**—Truly a marvelous radio combination! Anyone can operate it in a minute! Sent complete with "Mike-Phone", instructions, etc. **PRACTICAL—SIMPLE —A REAL VALUE!** Beautifully finished in durable steel crackle case. **SEND ONLY $1.00** (Check, M. O., Cash) and pay postman only $3.99 plus postage. **GUARANTEED.** Order your **"TINYDYNE"** now and have the newest thing out!

MIDGET RADIO CO., DEPT. TM-5, KEARNEY, NEBR.

For Dogs Only!

[*Continued from page* 131]

an asset to the garden instead of a detraction, as are many canine cottages.

The sides, front and back are cut from pine or fir, to the dimensions and shapes indicated in Fig. 14. Holes for the rope mattress support should be drilled before frame is assembled. Next, fasten the frame together with casein glue and 2-in. No. 9 woodscrews. Since the doghouse is to stand outside in all kinds of weather do not use steel screws—galvanized or brass are correct.

Turn down the ends of a 1-in. square piece of wood for the axle as shown, and slip it into the notches in the sides, where it is securely fastened. Place a large brass washer over each end of the axle, followed by the rustic wooden wheels. The latter are then held on by small wood pegs driven tightly into holes drilled in the extremities of the axle. You will now have a sort of barrow frame that can be moved about at will.

Through the holes previously drilled for the purpose, weave the bedding support from clothesline or manila rope, knotting the ends to hold it in place. Bend in the wire arches for the canopy, and make them firm by running a third wire lengthwise between them, at the top. The complete unit now appears as in Fig. 17.

A bright colored canopy of waterproof material, attached with drawstrings, completes the "dog-barrow." Bedding should match the top. The dimensions shown are for average sized dogs. For larger or smaller dogs, alter to suit.

The "Mighty Mite"

[*Continued from page* 92]

socket. Then rotate C1 and a point will be found where the plate current drops to about 30 ma. Now, connect a 25 watt bulb in a socket to terminals 1 and 2, and place the tap on L1 about one-third from the ground end. With C2 at maximum it should be possible to light the bulb to practically full brilliancy, at which point the plate current should be about 100 ma.

The high voltage should be about 500 volts with the key up, and 400 volts with the key down, and the tube drawing 100 ma., as measured directly across C7. The screen voltage tap on R3 should be adjusted so that the voltage from ground to screen grid is 300 volts. Do not exceed any of these voltages, or run the plate current over 100 ma. when the tube is properly loaded.

A separate crystal is required for each band, and bargain or cheap crystals should be avoided, for, while they may work, a good active crystal is a necessity in circuits of this sort to assure clean, rapid keying. The crystal is protected by the bulb P1, which should be a 2-volt bulb with pink head. This should never light more than a moderate yellow-white, and with the proper antenna or light bulb load, it will not glow at all. Should

[*Continued on page* 133]

The "Mighty Mite"

[*Continued from page* 132]

the bulb light to a dazzling white as C1 is rotated, *do not* keep the power on, as the crystal is practically sure to be damaged.

If the circuit constants and parts list are carefully followed, and the parts layout made as shown in the illustrations, no trouble should be encountered. *Do not* change the values of R4 or C5, as they have been carefully selected. The former suppresses all tendency to parasitic oscillation in the screen grid circuit, while C5 is of the proper value to allow a small amount of regeneration so that there can be rapid keying.

The best and cheapest tube to use is a 6L6G, but a 6L6 metal type is a close second choice and will give fine results. Several manufacturers produce 6L6G tubes with Isolantite bases which also are very satisfactory.

The little transmitter, when running at a plate current of 100 ma., will produce about 20 watts or so output which is sufficient to do real business, both DX and local.

As with *any* transmitter, it is absolutely necessary to have a license from the Federal Communications Commission to operate on the air. This costs nothing, and is easily obtained by any one with a knowledge of the fundamentals of electricity and radio. There are no restrictions as to age or sex; the only important requirement is that the applicant be a citizen of the United States. Examinations are held regularly in many cities, and also by mail for the benefit of people living in rural districts.

Beginner "hams" will find two booklets of considerable help in getting started on the air. They are "How to Become a Radio Amateur" and "The Radio Amateur's License Manual." These contain answers to the many questions that beginners always ask, and have helped many amateurs to obtain their coveted "tickets." Copies of these booklets cost 25 cents each, postpaid, and are obtainable from MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y. Be sure to write your full name and address clearly when ordering.

Beetles To Face "Yellow Peril"

A "yellow peril" will confront Japanese beetles when they swarm out of winter quarters for this spring's campaign. Tests by the U. S. Bureau of Entomology and Plant Quarantine have shown that the standard sheet-metal beetle traps attract half again as many insects when they are painted yellow as when they are colored in the present green-and-white combination. So look for daffodil-colored bettle traps among the shrubbery.

Makers of incandescent lamps use extreme care; moisture of a single drop of dew would be enough to cause early blackening of half a million lamps.

• NEW DE LUXE ZEPHYR •
COMPLETES CORONA LINE

De Luxe Zephyr $39.75
Regular Zephyr $29.75
CORONA SPEEDLINE
3 models
$49.50 and up
(prices subject to revision)

Now five models to choose from, each "tops" in its price class... each bearing the "best known, best liked" name in portables. Write for booklet.

CORONA PORTABLES

L C SMITH & CORONA TYPEWRITERS INC
Desk 5, 187 Almond Street, Syracuse, New York
Please send me free folder describing Speedline Coronas.
Name_____
Addr[illegible]
City_____

MENDS MOST ANYTHING

Iron Glue holds tight, is extra strong. You can buy it 'most anywhere—¼ pt. to 1 gal. cans or 10c bottles. **FREE:** Send post card for booklet, "Better Results with Glue," to: McCormick Sales Co., 406 Light St., Baltimore, Md.

IRON GLUE
AN ELEPHANT FOR STRENGTH

Refrigerators Need 3-IN-ONE

Periodical lubrication with HEAVY BODY 3-IN-ONE Oil helps electric refrigerators to give longer, quieter service with fewer repair bills. Get it at Hardware, Drug, Grocery, 10¢ Stores. Try it!

Ask for
HEAVY BODY
3-IN-ONE Oil

SPECIAL ADVERTISING OFFER! To Make New Friends

Shape No. 40

MONEY BACK GUARANTEE

COMPLETE $1 POSTPAID

Genuine 'SECONDS' of Regular $5.00

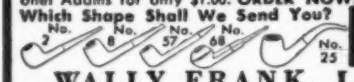
WALLY FRANK PIPES WITH TWO 15¢ PACKS OF COLONEL ADAMS TOBACCO

These pipes have slight surface imperfections—guaranteed not to impair their wonderful smoking qualities. Made from the finest Corsican Briar Root—dry-smoke filter—natural finish—no breaking in.

INTRODUCTORY COMBINATION BARGAIN!

To convince you of the mild, mellow, flavorful character of our famous Colonel Adams Tobacco, we want you to smoke it in a really GOOD pipe. That's why we make this bargain offer to you—1 Genuine "Second" of a regular $5.00 Wally Frank Pipe and 2 full sized regular 15¢ packs of Extra-Mild Colonel Adams for only $1.00. ORDER NOW!

Which Shape Shall We Send You?



WRITE FOR FREE CATALOG

WALLY FRANK, Ltd.

10 East 45th St., New York, N. Y.— Dept. 47

Watch For Fawcett's New

Flying Manual!

Everything you want to know about planes and flying will be found in the big, new Fawcett's **FLYING MANUAL**, on sale soon. Watch for it!

FLYING MANUAL tells you how to start an aviation career without spending a penny! This 144-page book, lavishly illustrated, contains plans for building a ground trainer, glider, taxiing practice plane, and many other aviation projects.

FLYING MANUAL gives complete information on where and how to get flight training, and includes expert tips on soaring, plus complete data on every phase of flying.

FLYING MANUAL authors include Maj. General H. H. Arnold, Chief of U. S. Army Air Corps, Richard DuPont, soaring champ, and many other experts.

FLYING MANUAL goes on sale at all newsstands April 17 for only 50 cents! Mail orders can be sent now to:

FAWCETT PUBLICATIONS, INC.,
GREENWICH, CONN.

The Modern Farm Shop

[*Continued from page* 100]

prove satisfactory. Where current is not available—and to be satisfactory this must be the common 110 volt, alternating kind—then you'll have to resort to a gasoline engine and line shaft. Thousands of farms today, however, have access to electricity, which wasn't even a remote possibility a few short years ago. And tomorrow, added thousands of farmers will haul their old gas engines to the nearest auction sale and install electric motors. For many of the modern small shop machines, a good used motor from a washing machine will prove quite adequate, particularly for the jig saw, lathe, band saw and drill. If the bench saw is more than 7-in. in diameter, however, the motor used should be at least ⅓ and preferably ½ horse power. And motors of 32 volt type can be used quite satisfactorily to operate machines even when the current comes from a power plant right on the place. In fact here you have two choices. You may belt the engine to a machine or line shaft, or use the 32 volt motors connected to the house line.

It's hard to lay down rules—even suggestions—about shop equipment. Opinions differ, conditions vary and usually cost is an important item. The drawings cover a wide range of equipment, designed to meet most possible requirements.

A good lathe comes close to being the one universal shop machine. In Figure 7 a simple lathe operation is being made, but this same headstock takes a chuck, thus permitting all types of drilling and boring to be done. (It can take the place to a limited extent, of a drill press.) With a sanding drum and disc, you can do all sorts of fast and accurate sanding. Emery wheels, buffing wheels and steel wire wheels which also fit onto the lathe headstock, all give added range to this universal tool, permitting you to scour, sharpen and polish in jig time.

The above refers to a good wood lathe. The metal lathe is perhaps even more appropriate for the farm shop, particularly if it is equipped with ball or roller bearings. These permit using the lathe at higher sustained speeds which are essential for grinding and polishing. For wood turning can also be done on the metal turning lathe. Some lathes too, have metal spinning accessories available at nominal cost. One handyman uses his lathe for polishing broad metal surfaces by coating a wood spindle between centers with liquid glue and dusting this while wet, with all the emery dust it will absorb. When the glue hardens and the motor is started, the abrasive spindle polishes quickly, as Figure 8 shows. Figure 9 shows how the lathe may also be used as a gluing jig. Figure 11 is a drawing of a walnut lamp turned in a small lathe, made to resemble the old fashioned kerosene lamp. But it's wired for a light bulb. The darning basket in Figure 10 looks like a complicated project, but the dowels are skewer sticks,

[*Continued on page* 135]

The Modern Farm Shop

[*Continued from page* 134]

the two rings, lid and base, simple lathe turnings.

The frame shop is especially adapted to vast storage space for small articles. Figure 18 suggests the possibilities. Between as many studding as desired may be built shelves and bins and thicker pieces with holes bored part way through them to take many small tools with single shanks.

Since a pair of saw horses is required equipment in most shops, the one in Figure 13 is shown because of the open top feature. This hollow space permits the worker with but one hand to carry not only the saw horse, but tools and nails and screws and other equipment in the top compartment.

For those desiring to make some of their own equipment, the rail anvil shown in Figure 12, is presented. This comprises a length of railroad iron preferably from 32 to 36 inches long, and a wood frame of the dimensions shown. The recesses for the rail should be made to make a pinch fit so the "anvil" will remain in place. Holes drilled in the protruding end permit the usual punching, riveting and drilling operations.

If the shop building is of masonry, then a protruding beam will be worth the slight cost. It permits any heavy article, such as the auto engine, to be easily raised with ordinary block and tackle, or the wire stretcher.

Another good homemade gadget is the grinder shown in Figure 17. Set in a concrete block, this half rear car axle has well seated bearings, may be run at high speeds without heating or requiring any attention. The brake drum is belted to the power plant.

A good type of large drum sander is shown in Figure 16. Here a washing machine motor is connected by means of a door spring for belt, to a wood pulley on the shaft of the drum whose ends are floor flanges fitted to a wood cylinder. The clock spring permits a cushioned drive.

Old cream separator bases usually make good foundations for the emery stand. One type is shown in Figure 14 but this one, being adapted to heavy work, is run with the tractor and is used to grind down plow lays.

If the old style, wet grind stone is moved in doors, made to turn by motor or engine power, then the installation shown in Figure 15 will be found useful. Here the fuel tank from an old gasoline stove is rigged up with pipes, valve and a T pipe unit just over the stone. This T unit has two small holes, permitting the water to drop as fast as desired, not on the center of the stone, but each side of center.

Terns that have been banded for identification when they were in northern Labrador have been observed from place to place, and it appears that their round trip flight carries them 20,000 miles—across the Atlantic to Europe, south along the African coast to the Cape of Good Hope, to Antarctica and back.

HOW TO GET WHAT-EVER YOU WANT IN *Photography*

FREE BOOK SHOWS HOW

Save time and money! It's the brand new edition of our Guide to Better Buys in photography. Bigger, better, packed with more values than ever! And every one of its pages about cameras or camera supplies.

CAMERA FANS! Here's the smart way to go shopping . . . the sure way to get what you want. Make this book your buying—and *saving*—guide. Order at home. Take advantage of the unusually wide selections of world-famous cameras and supplies this great book offers. Study models, features, prices before you buy. Save time and money. Tear off coupon and mail today. ***The book is FREE!***

LAFAYETTE CAMERA

NEW YORK, N. Y. 100 SIXTH AVENUE
CHICAGO, ILL. 901 W. JACKSON BLVD.
ATLANTA, GA. 265 PEACHTREE STREET
BOSTON, MASS.
BRONX, N. Y.
NEWARK, N. J.
JAMAICA, L. I.

Rush ***FREE*** 1940 Camera Catalog

NAME Baden Branch Library
ADDRESS 8816 N. Broadway
CITY STATE
LAFAYETTE CAMERA
Dept. 22EC —100 Sixth Ave., New York, N. Y.

PASTE COUPON ON PENNY POSTCARD

BIG MONEY BUILDING MEAD'S
New Portable OUTBOARD BOAT
IN A FEW DAYS AT HOME!

Write for FREE Circular

Build this light 60 lb. tough, durable, seaworthy **portable Outboard Ki-Yak.** Take it anywhere by hand or car. Safe, leakproof, trouble free. More speed per horsepower, more miles per gallon. MEAD'S perfected aluminum-ribbed, cut-to-fit construction & it guarantees successful assembly quickly, easily, economically. New 69 lb. OK 4-man cars, sail, motors, 9 h. p. or less. Also 3 "OK" paddle-sail models from 20 lbs. to 45 lbs. Double Paddle or Oars INCLUDED with your Ki-Yak! Write for FREE lavishly-illustrated circulars, low Factory-To-You Prices!

MEAD GLIDERS, 15 S. Market St., Dept. M-50 Chicago, U. S. A.

Better Tools-Lower Prices
GET BALKO'S 1940 CATALOG!

THE CATALOG OF EVERYTHING IN POWER TOOLS, SPRAY EQUIPMENT, MODEL SUPPLIES, ELECTRIC MOTORS, Metal Lathes, accessories, Artist Air Brushes, Spray Guns, Elec. Bench Grinders, Grinding Wheels, Lathe Chucks, Micrometers, Pulleys, V Belts, Carving Tools, Compressors. BALKO'S complete stocks and fast service save you time and money. **Send a 5c stamp today for your big new copy.**

BALKO ELECTRIC TOOL & SUPPLY CO., 605 W. Washington, S-8, Chicago

Save on Everything in Radio

NEW 1940 RADIO CATALOG AND PROFIT GUIDE
Most complete line of latest radio sets, amplifiers, kits, tools and replacement parts. All leading brands at lowest prices. Fast Service. Guaranteed Quality

The **RADOLEK** Company
Dept. X-41, 601 W. Randolph St., Chicago
SEND FOR YOUR COPY TODAY

FREE RADIO PROFIT GUIDE

Classified Advertisements

Rate for classified ads, 15c per word (include name, address and all numbers), per insertion. Minimum 10 words. Cash must accompany order and be received in this office April 1st for the June issue (on sale May 1st). Address Classified Mgr., Mechanix Illustrated, 1501 Broadway, New York City.

ADVERTISING AGENCIES

ADVERTISE: 24 words, 149 newspapers $6.50. Lists Free. Advertising Bureau, 4515-B Cottage Grove, Chicago.

40 WORDS, 130 magazines, $2.00. 3 months, $4.00. Bagley Service, Box 2522, Portland, Oregon.

ADVERTISE. 20 words 10 magazines $2.00. Goodall, 628 Montgomery, San Francisco.

AGENTS WANTED

1000 BARGAINS. School supplies. Drug sundries. Razor blades. Food products. Punch boards. Carded goods. Dry goods. Novelties. Cosmetics. Soaps. Cutlery. Notions. Shoes. Radios. Ladies' hose. Lingerie. Toys. Terrific values. Free Catalog. Reliable Jobbers, 930 Roosevelt, Dept. C5, Chicago.

AGENTS: Smash go prices! Santos Coffee 12c lb. 4-oz. Vanilla 8½c. Razor Blades 10 for 8½c. 100 Sticks Chewing Gum 12c. 150 other bargains. Premiums. Experience Unnecessary. Carnation Company, MN, St. Louis, Mo.

LIKE Afternoons Free? Work home! 12,000 word surprise literature free! $2,000 month reported (fulltime—no implication exceptional amount can be duplicated). National, BX1240-V, San Bernardino, California.

BIG Money Applying Initials on Automobiles. Easiest thing today. Free samples. Also, sideline salesmen for short order Decalcomania Name Plates. "Ralco," 1305 Washington, Boston, Mass.

MAKE big money. 1000% profit applying gold colored sign letters. Offices—stores—trucks. Large sizes 1c. Beautiful Free samples. Modernistic, R-3000 Lincoln Ave., Chicago.

AGENTS—Opportunity make money; book containing 127 successful business plans; home-office; send for free introductory booklet. Elite Co., 214-G Grand St., N. Y.

CALL on Gas Stations, Garages, Stores. New Chemical Sponge whirlwind seller. Cleans autos like magic. Samples sent on trial. "Kristee", Dept. 118, Akron, Ohio.

WHERE To Buy At Wholesale 500,000 articles. Free Directory and other valuable information. Maywood MM. Publishers, 1107 Broadway, New York.

BIG money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 11, Dunellen, New Jersey.

BUSINESS Proposition Resilvering Mirrors, Autoparts, Reflectors, Making Chipped Glass Signs. Write Sprinkle, Plater, 850, Marion, Indiana.

GET Unseen, Unbelievable, Thrilling, Sensational, Profitable, Eastern Novelties. Samples 50c. Motiwala, Third Bhoiwada, 38U., Bombay2.

WINDOW Sign Letters. Penny Each, Large Sizes. New Styles. Absolutely Beautiful. Free Samples. Atlas, 7941-G Halsted, Chicago.

MEXICAN Curios sell on sight. Large profits. Free particulars. Samples 10c stamps. Marquez-MF Apartado, Mexico City.

300% PROFIT Selling Gold Leaf Letters for Store Windows; Free Samples. Metallic Co., 448 North Clark, Chicago.

Portable Floodlight Has Variety of Uses

This handy, portable utility floodlight has wide applications for lighting objects and operations not sufficiently illuminated by general lighting in garages, display rooms, studios and workshops. Adjustable, it can be rolled around or hung on the wall by a slot provided in the base.

ARCHERY SUPPLIES, SPORTING GOODS, ETC.

ARCHERY Supplies. Instruction Book and Catalogue 10c. Mid-West Archery, 2209-C East 75th, Chicago.

AUTOMOBILES—MIDGET CARS

FUEL Oil Conversions for Automotive, Marine engines, write for free literature. Houston & Logan Conversions, 2112 Addison, Berkeley, California.

MIDGET; Steel Channels $4.50; Rims; Everything; Literature 10c. Chuck Lackey, Pottstown, Penna.

AUTO SUPPLIES & EQUIPMENT

CONVERT your car to burn Diesel oil. Save up to 70% fuel costs. Cheap installation. Wonderful performance. Proven factory method. Different and better. Costs nothing to investigate. Write for free circular No. 5A. Harrington Company, 201-204 Manchester Building, Portland, Oregon.

AVIATION

GET Into Aviation! Train now at this Lincoln Aeronautical Institute for responsible position as Aeronautical Engineer, Air Transport Pilot, Aviation Mechanic or Aircraft Sheet Metal Craftsman. Good jobs open! Big Money Paid! We assist Graduates in locating positions. Part time employment for board and room while in training. Write today for information. Lincoln Aeronautical Institute, (Inc.), Lincoln Airplane & Flying School Division, 4005 Aircraft Building, Lincoln, Nebraska.

CONSTRUCT your own light plane, choice of three motors. Three view blue-print, pictures and details, 25c. J. W. Peterson Aircraft Co., 1139 Veto St., Grand Rapids, Michigan.

PROPELLERS: all types, Light Planes, Motors, Supplies, Headquarters detailed information, Flying manual 25c. Standard Aero Craft, Ft. Worth, Texas.

EMBLEMS, Jewelry, Apparel. Everything for the Airminded! Stamp brings catalogue. Aircrafters, 1206-M Second Avenue, New York.

AVIATION Apprentices—Airminded Young Men interested in training for entering Aviation as Apprentices see ad on page 25.

PROPELLERS for Airplanes, sleds, boats, fans, dehydrators. Catalog 10c. Banks Propellers, Love Field, Dallas, Texas.

BOATS, OUTBOARD MOTORS, ETC.

GENUINE New Evinrude and Elto outboard motors now as low as $26.50 (plus small transportation charge). Down payment as low as $6.00. Fifteen advanced 1940 models to choose from. Write for catalogs, boat directory and handy Boat-&-Motor Selector—all free! Address, Evinrude Motors, 4299 N. 27th St., Milwaukee, Wis.

BUILD Electric Outboard from automobile generator. Smooth—quiet. Uses car battery. Complete Plans 10c. LeJay Manufacturing, 514 LeJay Building, Minneapolis, Minn.

BUILD your own Kayak. Weldwood ready cut kits. Safest. Strongest. Catalog. Cre-Craft Boats, Dept. D, Millburn, New Jersey.

EASY Built Kayaks—Inboards—Outboards. Complete Kits. Free Catalog. Kayak Boat, 152-A East 129th, New York.

CONTEST, prize genuine sailboat. 42 page catalog, details 20c. Brownbilt Sailboats, Marblehead, Massachusetts.

FORD and Zephyr marine conversions. 10c coin. Lehman Engineering Company, Dept. C, Newark, N. J.

BODY-BUILDING COURSES

EXERCISE equipment, courses. Special offers! Free booklet. Good Barbell Co., Dept. 10, Reading, Pa.

BOOKS & PERIODICALS

JUST Off the Press! The all-new edition of HOW TO BUILD IT, packed full of fresh projects for the home workshop, is now available at only 50 cents, postpaid. Valuable for beginners and experts alike. Dozens of simple, easy-to-make plans for power bikes, water skiis, lamps, electrical and radio projects, metal working, etc., etc. Send money order, check or stamps to Dept. C-1, Fawcett Publications, Inc., Greenwich, Conn.

SAVE Money! Do your own repair work around the house without calling in professional help. HANDY MAN'S HOME MANUAL tells you how. This 144-page book is full of easy how-to-repair, how-to-make, and how-to-improve kinks. Written in simple language. Illustrated. Only 50 cents. Send money order, check or stamps to Dept. C-1, Fawcett Publications, Inc., Greenwich, Conn.

BUILD IT YOURSELF

MIDGET racecars, sportcars, motorscooters. Bargain lists—used motors, midgets, parts—20c. Catalog new kits, parts, plans, 10c. Circulars free. Midgets, Box 543-B, Zanesville, Ohio.

New Electric Outlet Prevents Groping

If you've ever groped blindly in the dark trying to get the two points of an electric plug into the sockets, you will appreciate this new wall outlet, circular in shape, which enables one to plug in an electrical appliance without locating the exact points.

MOTORSCOOTERS, Midget Cars! Easily built. Complete plans and literature on motors, wheels, tires, attachments for motorizing bicycles, etc., 10c. Honsaker, Masontown, Pa.

BUILD power Scooters, Midget Cars. We supply tires, wheels, motors. Lowest Prices. Send 10c for plans, etc. Bild-Ur-Own Devices, Dept. 5-D, 536 North Parkside, Chicago.

BUSINESS OPPORTUNITIES

PLASTEX Industry needs manufacturers on small scale and for big production of Art Goods and Novelties in Plastex and marble imitation. Cheaply and easily made in our guaranteed rubber moulds. We are now placing big chain store orders with our manufacturers. You are just in time for big wholesale season now starting. Interesting booklet mailed free. Plastex Industries, Dept. R, 1085 Washington Ave., New York.

START Home Business Making Statuary—Plaques—Art Goods—Novelties—Souvenirs—Concrete Pottery—Garden Furniture—Artificial Marble Flooring—Liquid Marble. Make your Own Flexible Molds. Amazing Profits. Valuable Folder free. Creative Publishers, M-5, Glencoe, Illinois.

WE HELP start you in business, furnishing Outfits and Instruction, operating "Specialty Candy Factory" home. Men—women, opportunity to earn good steady income, all or spare time. (Our 31st year.) Booklet free. Ragsdale Candies, Drawer 110, East Orange, N. J.

COLOR Concrete with chemicals. Stucco-rock. Cement Artistry. Benches. Wishing-wells. Spin concrete pottery. Miniature castles, water-mills. Cold-glaze, water-paints, marbling. Sample 10c. Hollywood CementCraft, 8528 Wonderland, Hollywood, California.

MAKE Artificial marble, glazed tiles, uncanny. Tabletops, plaques, floors, bches, novelties. Hard, fireproof, inexpensive, cement secrets, Brilliant tile and liquid rubber samples 3c. John H. Payn, 945 Grande Vista Avenue, Los Angeles, Calif.

LIKE Afternoons Free? Work home! Expect surprise details! $2,000 month (orders) reported (fulltime—no implication exceptional amount can be duplicated). National, BX1240-W, San Bernardino, California.

MANUFACTURE from Phospholene. Bleach 2c gallon; Glass Spray 1c gallon; Hand Soap 2c pound; and ten fast sellers. Sample 25c. Details free. Western, 402 Climax Bldg., Cleveland, Ohio.

GOOD Paying Business silvering mirrors, plating autoparts, reflectors, bicycles, bathroom fixtures by late method. Free particulars and proofs. Gunmetal Co., Ave. A, Decatur, Ill.

GET Big Mails—Samples Galore. Your name listed in Midstates Mail Trade Directory, copy sent you, Directory 500,000 articles wholesale, 10c. Eagle, 414-M W. 65th, Chicago.

IF YOU are looking for a chance to devote your spare or full time to profitable work see our offer on page 12. Metal Cast Products Co., 1696 Boston Road, New York City.

THOUSANDS cemeteries, parks, etc., use, buy. Build steady business. Fifty dollar profits. Responsible men only reply. Leads furnished. Orr Co., 10019 Western, Chicago, Ill.

SUCCEED With Your Products. Make—Sell Them. Formulas, Processes, Accurate Analyses. Catalog Free. A. Thaxly Co., Washington, D. C.

YOU'LL Like Resilvering Mirrors, Autoparts, Reflectors, Making Chipped Glass Signs. Write Sprinkle, Plater, 845, Marion, Indiana.

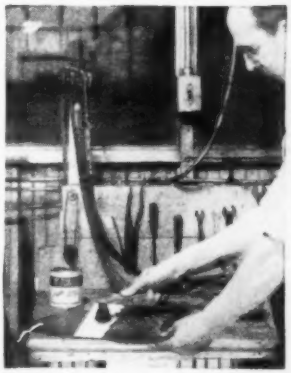
SELL Yourself, Be Independent, Successful. Big Money Possibilities, Free Literature. Rankin, Glover Bldg., Kansas City, Mo.

107 WAYS to make money, in home or office, business of your own. Full particulars free. Elite Co., 214-G Grand St., New York.

Floss Holder Makes Teeth Cleaning Easy

Use of dental floss, recommended by dentists to clean hard-to-reach parts between the teeth is made easy by this new, simple dental ring. There is a simplified button top around which the floss is wound and held securely, and which may be gripped to hold the ring while using.

New Solder Is Applied With Brush



Labor costs are materially reduced by using a solder preparation that is applied by brush and which requires no cleaning of the surface prior to application. Requiring no flux, soldering iron or melting pot, the solder is melted by any heat source. There is no surplus solder to melt and drop off, and it is especially useful for soldering small articles where irons are usually difficult to manipulate.

FREE Literature describes hundreds plans for making money locally and by mail. Gilbert Supply, 5-M West 24th, New York.

STEADY Income—Quick Action Business Plans—Descriptive Booklet Free. L. D. Miller Co., Arlington Heights, Ill.

OPERATE a Collection-Credit Bureau. Very profitable. Permanent. Free folder. Cole Associates, Syracuse, N. Y.

AGENTS—To mail our literature. Good profits. Home business. M. Maywood, 1107 Broadway, New York.

SELL by Mail! Books, Novelties! Bargains! Big profits! Particulars Free! H. Elfco, 438 North Wells, Chicago.

CASTING business, five bronze molds. Sell Cheap. Products good Sellers. GP., 375 Kathryn Place, Akron, Ohio.

HANDY MEN—Earn money home operating Community "Fix-It" Shop. Stafford, Makanda, Illinois.

HOW And Where To Obtain Capital. Fully explained particulars free. Star Service, Wapakoneta, Ohio.

GRIND Lawn Mowers—Factory method. $2.00 capital. Mowers, Janesville, Wis.

RUBBER-MOLD Making. Plaster Casting. Instructions 25c. Kemixal, Parkridge, Illinois.

CAMERAS & PHOTO SUPPLIES

CAMERAS and supplies. Free illustrated catalog listing everything photographic—still and movie cameras, films, lenses—at tremendous savings. Hundreds of bargains, new and used. All guaranteed. We take your old camera or equipment in trade. Write now for your free copy of our newest money-saving bargain book—just out! Limited edition. Hurry! Central Camera Co. (Photographic Headquarters since 1899), 230 S. Wabash, Dept. E-11Z Chicago, Ill.

New Ink Stand Fills Drafting Pen

A new ink stand for filling ruling pens which saves considerable time and ink over the usual handfilling method has recently been introduced. The stand consists of three parts: a stand which holds the regulation ink bottle; a dipper arm which closes the bottle tightly when not in use; and a finger-touch lever which raises a filling loop on the end of the arm from the bottle. To fill the pen, the user lifts it from his work, reaches out, presses the lever with his little finger and touches the pen nibs to the loop.

PHOTO FANS! Here's a bargain book that will help you take, develop and enlarge better pictures. PHOTOGRAPHY HANDBOOK No. 4 contains scores of articles and tips on all phases of picture-taking. Fully illustrated, 144 pages, written by experts—and only 50 cents, postpaid. Send money order, check or stamps to Dept. C-1, Fawcett Publications, Inc., Greenwich, Conn.

MAKE Money in photography. Learn quickly at home. Easy plan. Previous experience unnecessary. Common school education sufficient. Interesting booklet and requirements free. American School of Photography, 3601 Michigan Avenue, Dept. 2049, Chicago.

BLURIBBON Bargain. Excellent Candid Camera $1.98 C.O.D. Monroe Sales, Springfield, Ohio.

FREE Bulletin, Expert Photography, Order Today. Rankin, Glover Bldg., Kansas City, Mo.

CARTOONING, SIGN PAINTING, ETC.

LEARN Cartooning. With this snappy, interesting, practical illustrated method. 50c complete. Studios Of Cartooning, 1202 Carroll St., Brooklyn, N. Y.

CHEMISTRY

CHEMISTRY Courses (Slightly Soiled) at bargain. Particulars. F. Shapereau, 620 E. 8th St., Brooklyn, N. Y.

JOIN American Amateur Chemists Society. Prospectus, Journal, 10c. Haslett, Mich.

DETECTIVES

DETECTIVES—Work Home—Travel. Experience unnecessary. Detective Particulars free. Write, George Wagner, 2640-V Broadway, N. Y.

EDUCATIONAL & INSTRUCTION

U. S. GOVERNMENT Jobs. Commence $105 to $175 month. Men—Women. Dependable jobs. Short hours. Prepare now in your own home, for next examinations. Common education usually sufficient. Full particulars and list positions Free. Write today sure. Franklin Institute, Dept. D43, Rochester, N. Y.

WATCH Repairing is steady profitable work. Experts usually in demand. You can learn watchmaking trade at home, spare time. New original instruction system. Script engraving course included. Write for free details today! Nelson Co., E-2002 Manhattan Building, Chicago.

LEARN law at home quickly under personal instructions of an ex-judge of 25 years legal experience. Particulars. Walter G. Walker, Box 1052-B, Daytona Beach, Florida.

ELECTRIC FENCING

JUST out! New Amazing ball bearing electric fencer made from auto coil. Nothing else on market equals this invention. Build your own. Complete plans and 1940 catalog 10c. LeJay Manufacturing, 914 LeJay Building, Minneapolis, Minnesota.

ELECTRICAL SUPPLIES & EQUIPMENT

ELECTRO-SCRIBE: Electric Pencil Writes—Engraves all Metals $1.00. HEALTH LAMP: Dual Ray, Ultra Violet, Infra Red—Promotes Sun-Tan-Vitamin "D". Automatic—AC-DC current, $3.90. Details. Beyer Mfg. Co., 4515-G Cottage Grove, Chicago.

ALNICO Magnets—Sample 25c. Terry Sales, Central Station, Box 781, Toledo, Ohio.

FOR INVENTORS

INVENTORS—Don't delay. Protect your idea with a Patent. Get Free Patent Guide. No charge for preliminary information. Write Clarence A. O'Brien, Registered Patent Attorney, OE3A Adams Building, Washington, D. C.

INVENTORS: Sell your unpatented invention with positive safeguards under patent laws. New low-cost procedure. Complete details, free. American Patents Corporation, Dept. 5-E, Washington, D. C.

WE LOCATE buyers meritorious patented, unpatented inventions. If will sell, reply immediately. Descriptive booklet, references, free. Invention Reporter, 4A-11236 South Fairfield, Chicago.

Kit Makes Plastic Carving Easy

This new plastic kit contains everything essential to complete enjoyment of creative workmanship in the fascinating new field of plastics. Included in the outfit is a high-speed electric grinder, an assortment of attachments, and a supply of plastics.

Dashboard Switch Unlocks Gas Tank Cap

Protection against gas thieves is offered by a snap-up gas tank lock which is operated from a push-button on the dashboard. The cap is fastened permanently to the car and cannot be lost, pried open, or stolen. To operate, the ignition is turned on, the dash button is pressed, and the cap unlocks and snaps open. Closing the tank caps locks it automatically.

WE SUCCESSFULLY sell inventions, patented and unpatented. Write for proof, and tell us what you have for sale. Chartered Institute of American Inventors, Dept. 5-B, Washington, D. C.

INVENTORS: Send for my free 72-page book. Conscientious, prompt personal service on all patent matters. Registered Patent Attorney, L. F. Randolph, Dept. 341, Washington, D. C.

INVENTORS Models Expertly Made. Lowest Costs, Confidential. Write for Wire H. Moore, Box 500, Fresno, Calif.

CASH for practical ideas and inventions. Stamp appreciated. Mr. Ball, FA-9441 Pleasant, Chicago.

GET Your Own Patents. Legal blanks, complete instructions $1. Cudding Sons, Campbell, California.

FORMULAS, PLANS, ETC.

THAXLY Formulas for perfect products. Accurate Analyses. Catalog Free. A. Thaxly Co., Washington, D. C.

FORMULAS. Latest Money Makers. Literature free. D-Belfort, 4042 N. Keeler, Chicago.

FORMULAS—Literature free. Andco Laboratories, 225—7th St., Rockford, Illinois.

FORMULAS—All Kinds. Guaranteed. Catalog Free! Kemico, 67 Parkridge, Illinois.

HELP WANTED

SALARIED Positions: $2,500 yearly and up. None less. Let us try to get one for you; moderate cost. Write for valuable information (Desk 4). Executive's Promotion Service, Washington, D. C.

HOW To Get a Good Job. Inside information by experienced business men, specially printed to help you. Send 25c today. J. Bannick, Harper Station, Detroit, Mich.

RELIABLE Information how to obtain salaried positions. Details Free. Johnson, F-1315 East 62nd, Chicago.

Tape Dispenser Has Many Uses

A new Scotch tape dispenser recently put on the market is light and compact and was made for both office and home, because of its great number of uses in sealing, mending and holding. It makes the use of tape convenient and handy and has nothing to get out of order.

HOME CRAFTSMAN

PATTERNS, PLANS: 40 lovely plywood Novelty Furniture—easily jig-sawed. 40 Bird Houses. 100 large Silhouettes. 236 other projects. Lowest prices Decal Decorations. Superbly illustrated literature. Write Wo-Met Shop, Ashburn, Georgia.

22 FULL size lawn ornament patterns 25c. 25 novelty patterns 30c. Both sets 50c (coin). Strother, Box 383-AB, Belington, West Virginia.

BARNYARD Sketches. 10 lifesize lawn figures, designs 15c. Garden Woodcraft Studio, 2026 Broadway, San Diego, California.

HYPNOTISM

HYPNOTISM. Complete 20 Method Course 25c. Western Institute Hypnotism, MM-2984 North Ridgeway, Chicago.

INVENTIONS WANTED

INVENTIONS—Manufactured in any quantity at low cost by old-established reputable company. No branches anywhere. Stampings, metal specialties, dies, models, etc. Free estimates. Free Catalog. Crescent Tool Co., Dept. T-S, Cincinnati, Ohio.

SMALL Inventions wanted by manufacturers. I'll help you sell your invention. Write for free circular. Stanley Hull, 7829-I, Euclid Avenue, Cleveland, Ohio.

WANTED—Meritorious patented, unpatented inventions. Booklet, references, free. Invention Reporter, 4B-11236 South Fairfield, Chicago.

INVENTIONS Promoted. Patented or Unpatented. Write Adam Fisher Co., 582 Enright, St. Louis, Mo.

CASH for Inventions—Patented or unpatented. Stamp appreciated. Mr. Ball, FB-9441 Pleasant, Chicago.

MAGIC TRICKS, PUZZLES & JOKER NOVELTIES

TRICKS you can do! For Pocket—Parlor—Stage. With Coins, Cards, Cigarets, Ropes, Balls, Thimbles, Watches! Escapes, Mindreading, Spirit and Mental Magic! Illusions, Magical Books and Stage Supplies! Largest assortment: lowest prices! 100 Page Catalog 500 Popular Tricks 10c. 80 Page Catalog larger Stage Magic 10c. Write today! Lyle Douglas, Station A-3, Dallas, Texas.

THURSTON'S Card Trick Book. Profusely illustrated. Correct methods amateurs, professionals use. 35c. Houbeck, 6152 Guilford, Detroit, Michigan.

NEW, Giant Magic Catalog! Hundreds of items! Send 25c! Chicago Magic Company, B-2300, Mason, Chicago.

WE SUPPLY every noted magician. Large Professional catalog 25c. Holden, 222 West 42nd St., New York.

ELECTRIC Fun! 200 stunts 110 volts, $1. Cudding Sons, Campbell, California.

MISCELLANEOUS

ELGIN fountain pens. 5 yr. guarantee. $3 value 99c. Elgin electric shavers $2.19. Limited offer. Burton, Grant, Baxter Springs, Kansas.

RECEIVE gigantic mails, magazines, samples. Your name in numerous mailing lists 10c. Waltman, 460 Grand Street, New York.

BURIED TREASURE, Minerals, free booklet, photographs. Fisher, Palmer Bldg., Hollywood.

MODEL ENGINES

ASSEMBLE real fifth-horsepower gasoline engine. Completely finished parts kit, with Champion Spark plug, coil, gas tank, etc. Formerly $35.00; now only $4.95. Twenty minute assembly. Send $1.00, balance C. O. D. Catalog 6c. G. H. Q., Dept. AB, 40 East 21st St., N. Y. C.

MODEL RAILROADING

BUILD a Model Railroad in 00 gauge (¾ inch between rails). A complete catalogue of parts, construction kits, and completed units. Complete Catalogue 25c. Nason Railways, P. O. Box 8, Mt. Vernon, N. Y., Dept. 5X.

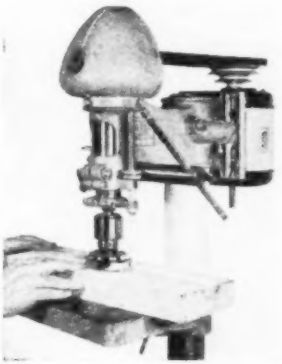
MODELS & MODEL SUPPLIES

NUMBERS, initials, names, seconds to apply. 10c each. Humen, 197 Pulaski, Perth Amboy, N. J.

MONEY MAKING OPPORTUNITIES

BOOKKEEPERS wanted for profitable bookkeeping work. Box 614, Kalamazoo, Michigan.

Rotary Planer for Home Workshop



A new rotary wood planer designed for home workshop use opens up a new and interesting field in fast, accurate wood planing. A combination wood planer, surfacer and finisher, the tool requires little skill to operate and is absolutely safe, even in the hands of the sheerest novice.

Bottle Gauge Measures Drinks

This device enables guests and customers to be served quickly and without spilling. It is automatic and is adjusted so that nothing is lost when the operator moves the bottle from one glass to the next.

MOTION PICTURES & SOUND EQUIPMENT

MOVING Pictures, Art Film, sample 10c. Many others, lists free. Goodwill Company, Jackson, Tennessee.

SENSATIONAL Films. List Free. Send 10c for Sample Film. Box 1504, Hollywood, California.

ART Films. Sample, dime; lists free. 2443 Gunnison, Chicago.

MOTORCYCLES, BICYCLES, MOTOR SCOOTERS & SUPPLIES

MOTORCYCLES, reconditioned. New, used, parts and accessories. All makes. Large stock. Bargains. Illustrated catalog, 15c. Indian Motorcycle Sales, Kansas City, Mo.

MUSIC—INSTRUMENTS & INSTRUCTION

POPULAR Orchestrations, Unbelievable Prices. Samples Free. MusicMart, 3311 Lawrence, Chicago.

PHONOGRAPH Records—Twelve, $1.00. Paramount, H-358 East Market, Wilkes-Barre, Penna.

PIANO by ear. Free booklet. Day-V-Way, 13265 Michigan Ave., Dearborn, Michigan.

PATENT ATTORNEYS

PATENTS—Take first step to protect your Invention—without cost. Get free Record of Invention form and 48 page Book, "Patent Guide for the Inventor". Time Counts! Write today. CLARENCE A. O'BRIEN, Registered Patent Attorney, OE3B Adams Building, Washington, D. C.

INVENTORS—Before disclosing your invention to anyone send for Form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions. Sent free. Lancaster, Allwine & Rommel, 426 Bowen Building, Washington, D. C.

"INVENTOR'S Guidebook" containing 96 mechanical movements and advice about patenting, selling inventions, also "Record of Invention". Free. Frank A. Ledermann, Patent Attorney-Engineer, 154 Nassau Street, New York.

INVENTORS: Send for my free 72-page book. Conscientious, prompt personal service on all patent matters. Registered Patent Attorney, L. F. Randolph, Dept. 763, Washington, D. C.

PATENTS. Booklet free. Highest references. Best results. Reasonable fees. Watson E. Coleman, Victor Building, Washington, D. C.

PATENTS

INVENTORS—Have you a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 5-A, Washington, D. C.

INVENTIONS Promoted. Patented or Unpatented. Write Adam Fisher Co., 582 Enright, St. Louis, Mo.

PERSONAL

WIN Prize Money: Booklet—"Successful Contesting"—shows how, 10c postpaid. Bulletin listing $100,000.00 Prizes included. World Publishers, 4515-K Cottage Grove, Chicago.

SERVICE—Anything you want done (my locality); business or other matter. Seaman, 3814 Meramec, St. Louis.

MEXICAN-AMERICAN Law Practice. Wm. Cocke, Amer. Atty., El Paso, Texas.

PHOTO DEVELOPING

AT LAST! All Your Snapshots in Natural Colors. Roll developed, 8 Natural Color Prints, only 25c. Reprints, 3c. Amazingly beautiful. Natural Color Photo, Janesville, Wisconsin.

8 ENLARGEMENTS—films developed plus 8 enlargements, 25c coin—116 or smaller. Enlarge Photo, Box 791, Dept. MI, Boston, Mass.

BREATH-TAKING hand colored enlargement, 5x7; 25c. Send negatives, coin. Calder, 775-P South Third, Philadelphia, Penna.

"SENSATIONAL Offer." Five 5x7 Enlargements 29c. Cardinal Photos, Summit, N. J.

PRINTING, MIMEOGRAPHING, ETC.

PRINT your own cards, stationery, circulars, advertising. Save money. Easy rules furnished. Print for others, big profits. Junior outfit, $9.00; Senior outfits, $17.00 up. Details free. Kelsey Presses, B-57, Meriden, Conn.

200 DISTINCTIVELY Printed Letterheads 8½ x 11, or 6¾ Envelopes, $1.00; 500 $2.15; 1,000 $3.98 postpaid. (Free Booklet). Wyatt, Printer, Box 1103, Florence, South Carolina.

HAMMERMILL Letterheads, any color paper, ink; 300 8½x11, $1.48 postpaid. 30 Type Styles. Free particulars. Woodruff's, 217M Lewis, Duluth, Minn.

125—8½x11 BOND Letterheads and 125 Envelopes, both printed, $1.00 prepaid. Benneville, 907 West Roosevelt, Philadelphia.

40 SHEETS, 20 Envelopes, 25c postpaid. Agents Wanted. Samples Free. Western Stationery, Topeka, Kansas.

PROFITABLE OCCUPATIONS

ANNOUNCING new home study course in commercial baking. Good field for ambitious men. Nearly depression proof business. Common school education sufficient. Send for free booklet "Opportunities in the Baking Industry" and requirements. National Baking Institute, 3601 Michigan Avenue, Dept. 2043, Chicago.

RADIOS

"SERVICING Hints" booklet free. Supreme Publications, 3729 Thirteenth Street, Chicago.

RADIO & TELEGRAPHY

RADIO Engineering, broadcasting, aviation and police radio, Servicing, Marine and Morse Telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, King St., Valparaiso, Ind.

RUBBER STAMPS & MARKING DEVICES

RUBBER Stamps your name and address. Federich Tool Co., Box 412, East Pittsburgh, Penna.

SALESMEN WANTED

COMPLETE Line everyday business necessities—over 2000 items. 50% savings to every merchant. Experience unnecessary. Samples free. Commissions advanced. Northwestern, 625-K Jackson, Chicago.

NEW sales stimulating plan for retailers pays big, quick profits. Novel, exclusive features. Sample outfit Free. Profit-Makers, 160 N. LaSalle, Dept. D-10, Chicago.

WINDOW Sign Letters. Penny Each, Large Sizes. New Styles. Absolutely Beautiful. Free Samples. Atlas, 7941-G Halsted, Chicago.

WANTED—Men to sell Citrus Fruits, Hardware and Clothing. Details for dime. Adrian Whitcomb, Umatilla, Fla.

SPECTROSCOPES

SPECTROSCOPE quickest way to analyze chemicals, ores $2.50. Cudding Sons, Campbell, California.

TATTOOING SUPPLIES

TATTOOING made easy. Outfits, Supplies, Design Sheets, Instructions, furnished. Literature Free. TATUCO, 651 South State, Chicago.

TATTOOING—Engraving Outfits. Illustrated List Free. Percy Waters, Anniston, Ala.

TELESCOPES, MICROSCOPES, ETC.

TELESCOPES, Microscopes, binoculars: 1940 bargain catalog free. Brownscope Co., 5 West 27th Street, New York.

TELESCOPES! Ten power, $3.25. Frederick Knight, 313 Elliott St., Syracuse, N. Y.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

TYPEWRITERS, Adder, Mimeograph, Multigraph, Addressograph. Send for Free lists of machines that will help you at half price. Pruitt, 27 Pruitt Bldg., Chicago.

WATCHMAKERS' SUPPLIES

WATCHMAKERS' Materials—Tools—Watches—Jewelry. Bought, Sold, Exchanged. Wholesale catalogue. Ben Segal Company, 59 East Madison, Chicago.

WELDING

LEARN Arc Welding. It's easy—get big pay jobs—complete individual instruction at bare cost of materials used. Write for details. The Arc Welding School, Box SM-5401, Troy, Ohio.

75-200 AMPERE Welders from old generators. Complete plans 35. Plans show single and dual welder connections. LeJay Manufacturing, 314 LeJay Building, Minneapolis, Minn.

BARGAINS, Demonstrator Arc Welders, Gasoline and Electric drive. Liberal trial, easy terms. Write Hobart Welder Exchange, Box SM-5402, Troy, Ohio.

WIND ELECTRIC PLANTS

BUILD electric plant for your cabin. Operates from wind. Complete plans and valuable catalog 10c. LeJay Manufacturing, 414 LeJay Building, Minneapolis, Minn.

New Phototube Measures Ultraviolet

Dr. L. R. Koller, of the General Electric Research Laboratory, Schenectady, N. Y., is pictured holding the new phototube recently developed by the laboratory.

Made of a special ultraviolet transmitting glass, the phototube incorporates a "bubble" window .002 of an inch thick and a sodium cathode. It has a maximum response at a wave length of about 2500 Angstrom units in the invisible ultraviolet spectrum and a very small response to visible radiation. Among its applications are mercury vapor detection and the measurement of ultraviolet output of low pressure mercury germicidal lamps.

Mining Mushrooms

[*Continued from page 51*]

"We figured that cats, or rats, must have been the cause. We set traps in various parts of the mine and, on a hunch, set a number of larger traps. After a few days we caught a couple of good sized raccoons. With the setting of more traps we finally rounded up the entire family, and things started to move along in much better fashion.

"Today, we still occasionally run across a raccoon in the mine, but since then have never been seriously bothered by them. The mushroom gnat never did put in an appearance with the result that after those first few months, we had practically eliminated all waste."

The method employed in cultivating the edible fungus in a mine does not offer any particular difficulties. Beds are made containing at the bottom a deep layer of fresh stable manure, over which is a layer of well-rotted manure. In this the spawn is planted after the temperature of the bed has fallen to 90 degrees.

The commercial spawn comes in two forms, bricks and flakes, made of horse manure impregnated with the mycelium of the fungus. When planted, both kinds are broken up and distributed throughout the beds. The beds, which must be kept moist, but not wet, are then well covered with straw or mats to keep the surface moist.

After a week or ten days the mulch is removed and the beds covered with good loam to a depth of about two inches. They may again be covered with mulch, which is removed when the mushrooms, which are gathered daily, begin to appear.

Although mushroom culture is sometimes interfered with by parasitic fungi, especially the species of Mycogone, through which serious losses have been reported here and abroad, the condition is easily remedied in the mine by regular fumigation with formaldehyde gas.

For eating purposes, the mushrooms are gathered daily when very young to insure only the purest and finest quality. Like all green vegetables, mushrooms have a high water content in proportion to their bulk and, as regards protein content, they rank about the same as potatoes.

Here are a few tips for the amateur collector of mushrooms, particularly those who comb the wood for these little tidbits, as given by Mr. Bell:

"Don't pick mushrooms when in the button or unexpanded stage, and also avoid those in which the flesh has begun to decay, even if only slightly. Also, avoid all mushrooms which have stalks with a swollen base surrounded by a sac-like or scaly envelope, especially if the gills of the mushroom are white. Also, avoid fungi having a milky juice, unless the milk is reddish."

It is pointed out that these precautionary methods are not absolute because there are occasional exceptions. The measures, however, are generally safe for the novice to follow.

ADLETS FOR HOBBYISTS

(See regular classified section for rates and other information.)

STAMPS

SUPER-WONDER Packet offered, containing 60 different stamps from Afghanistan, Transjordania, North Borneo, Manchukuo, Sudan, Guadeloupe, Iraq, Sarawak, French and British Colonies, including natives, beasts, ships, etc. This entire packet for only 5c to approval applicants. Big illustrated lists free. Kent Stamp Company, Box 87-Z (G.P.O.), Brooklyn, N. Y.

NEJD (Saudi Arabia) Bolivia Eucharistic Triangle, Cayman Island Pictorial, Negri Sembilan, Turks & Caicos Islands, Manchukuo, Bahamas War Provisional, Five Dollar United States, British Solomon Islands (Cannibaland). Everything 3c with our famous approvals. Viking Stamp Co., 1-R, Hanson Pl., Brooklyn, N. Y.

BECOME Mail-order Stamp Dealer. Men—Women, Young or old. Spare Time at home. Make more money than working hard on job. Free instructions sent that guarantees success. Confidential wholesale pricelist included. Postage 3c. Superior Wholesale, 276 Palms Station, Los Angeles, California.

STAMP Magazine Free—Breezy, Authoritative, Articles on New Issues, Questions and Answers, Philatelic Subjects. Sample Copy Philatopic Monthly Free. Empire Stamp, Dept. MM, Toronto, Canada.

STAMPS! 100 diff. 3c; 500 diff. 35c; 1,000 diff. 90c! Illustrated Album (4000 spaces) 22c. Approvals sent. Tatham Stamp Co. (D9) Springfield, Mass.

STAMP collecting is lots of fun. Begin Now! Stamp Packet, and illustrated Stamp Album, 25c Post paid. The Specialty Shop, Centreville, Alabama.

UNITED STATES—45 different, Hinges, Gauge, Pricelist all for 10c. No approvals. Seidenberg, Baroda, Mich.

FORTY Country mixture, including scarce Fiji—300 stamps, 25c. Guy Elsea, Bowling Green, Ohio.

FREE!!! Austria War Set. Postage 3c. Williams, 603 Archerbldg., Baycity, Michigan.

FREE!!! Royal Visit Packet. Postage 3c. Roberts, 312T Shearerbldg., Baycity, Mich.

FREE Stamp Plan, Bargains, Approvals. Rankin, Glover Bldg., Kansas City, Mo.

APPROVALS—½ Cent Up. Leo Martin, Glen Ullin, No. Dak.

INDIAN CURIOS & RELICS

INDIAN relics, Confederate bills, coins, gems, minerals, curios. Catalog 52 illustrations 5c. 100 good ancient arrowheads $3.00. Tomahawk head 50c. H. Daniel, Hot Springs, Ark.

SWORDS, Daggers, Pistols, Curios. Catalog 10c. Abels, E-860 Lexington Ave., New York.

RARE COINS

COMMEMORATIVE Half Dollars, Lincoln, Stone Mountain, Oregon, Texas, Cleveland, Kentucky, San Diego, Long Island, $1.50 each. Illustrated Catalogue No. 14, 25c. Norman Schultz, Salt Lake, Utah.

FREE: Foreign Coin, Banknote and Large Illustrated coin catalogue, for 4c postage. Approvals sent. Tatham Coinco, Springfield-9, Mass.

HOBBY JOURNAL

STAMPS! Coins! Hobbies from Hawaii! Chinese Hobby Journal. 50c year. Box 1813, Honolulu, Hawaii.

READY CUT HOMES

$416 and up. Freight paid. Save $500 or more. Buy direct. Modern production methods prevent waste in material and assembly time. 75 home plans to select from, including 10 new feature 1940 designs. All modern, practical distinctive, complete. Simple plans for easy assembly. Includes all lumber, insulation, roofing, bronze weather strippings, built-in features, attractive one-panel doors, latest hardware, nails, lath, paint, varnish. Also, summer cottages, garages, tourist cabins, etc. Information and plans for FHA financing requirements on request. For new 1940 full color catalog with floor plans, send 25 cents to cover mailing. Dept. M1-50, International Mill and Timber Co., Bay City, Mich.

NEW COLOR CATALOG FOR ONLY 25¢

STERLING HOMES

SHAW DU-ALL GARDEN and ALL-PURPOSE TRACTOR

Low "FACTORY-TO-FARM" Prices. 2 to 8 Horsepower Models. Walking and Riding Types. WRITE for 10 DAY TRIAL PLAN and BIG FREE CATALOG.
SHAW MFG. CO., 2905 Front St., Galesburg, Kans
5812ME Magnolia Ave., Chicago, Ill.
130ME W. 42nd St., New York
668ME North 4th Street, Columbus, Ohio

M. M. Earned $1174 at Home!

Earn Cash at Home!

We paid M. M. $1174 for exceptional "cellar crop" SNOW-KING mushrooms! Big free picture book tells if your cellar, shed, barn, suitable. We furnish materials, buy all you raise, guarantee starting crop. Write today for "Guaranteed Success Plan" backed by company established 1908—Twenty-five coast to coast branches.
UNITED MUSHROOM CO.
3848 Lincoln Ave. Dept. 474, Chicago

BIG PROFITS RESTRINGING RACKETS AT HOME! WRITE US!

Save On GUT! —Buy Direct from Factory SILK!

Earn big profits restringing tennis rackets at home. Easy work. Experience unnecessary. Save on your tennis, badminton, squash! Send for FREE CATALOG of Tennis Equipment—Hurry!
H. E. Wills Co., 1047 W. 47th St. Dept. M-50, Chicago, U. S. A.

ATTENTION PHOTO FANS!

You need more than a camera to take good pictures. GOOD PHOTOGRAPHY NO. 3 contains a wealth of information on taking and developing distinctive photographs. Contains articles by recognized authorities in the photographic field, and is illustrated with 80 salon prints. 50 cents at your newsstand, or postpaid from:
FAWCETT PUBLICATIONS, Inc.
Greenwich, Conn.

NOW a DYNAMIC HEAVY DUTY INDUSTRIAL WELDER for Only $19.75 RETAIL

WORKS Off 110-Volt Light Socket. This marvelous Dynamic Power Welder does the work of much higher priced types. It is easily portable. WELDS Cylinder Blocks, Bumpers, Fenders, Tanks, Farm Machinery, etc. Will also solder and braze on the lightest material. Works on iron, steel, tin, brass, copper and all other metals. Men without previous experience can make as much as $5.00 on a one hour repair job. In a year's time a Dynamic Welder COSTS YOU LESS THAN 6 CENTS A DAY

Free instructions—Open a welding shop now. AGENTS—Make big profits selling to garages, factories, janitors and machine shops. Write today for our 10-DAY TRIAL OFFER. DYNAMIC WELDER COMPANY, 2226-MX SILVERTON ROAD, CHICAGO, ILLINOIS

"Cape Cod" Garden

[*Continued from page 94*]

legs 11-in. apart at the ends, and 2 feet 11-in. apart at the front. A base consists of boards nailed around the bottom of the legs, and covered with boards, square holes being cut near the corners for the legs. Bore holes in the lower ends of the legs and fit casters in place. Each drop leaf is 12x17-in., and is attached to the ends of the table top with hinges, supported by a bar fastened to the underside of the table end with a screw. The table top is enclosed on the front and ends with a miniature picket fence. Each of the six posts, cut from 2x2 stock, has two blocks nailed to the top. The pales and rails of the fence are cut from stock ¼-in. thick and 1-in. wide. The fence sections can be glued in mortises cut for the rail ends to the posts, or nailed to the backs of the posts. Attach the posts of the fence with screws fastened from the underside of the table top. Use a galvanized iron tank about 6-in. high to hold the potted plants.—*E. V. H.*

Garden Faucet Pump

[*Continued from page 95*]

to form a sloping, overhanging roof. Finish the roof with old shingles or hand-split shakes. Tack tin flashing strip along the ridge. Before the roof is finished, however, the pump handle should be set in place. Nail two 2x4-in. blocks inside the pump house at a point about 22-in. from the top. A quarter-inch hole should be bored through both blocks to take the bolt with which the pump handle is secured. The handle is planed down, the lower part rounded as shown. A slot is cut in the side of the pump house for the handle, and a hole bored in the front side for the faucet or pipe opening. Drive stakes under the four corners of the well house so that they are about 4-in. above the ground. Slip the bottom board over the faucet or end of pipe and down to the ground, nailing it to the bottom of the pump house and to the stakes. Enclose the stakes with sections of board nailed around the base of the pump. Stain the finished pump a rustic brown, or give it a bright coat of paint. Place a large jar or piece of garden pottery under the spout to add color to the pump, and to catch any dripping water. The faucet or spout may have a threaded end for coupling on the garden hose.—*E. V. H.*

Each domestic science class in Lausanne, Switzerland, has adopted a needy Swiss soldier, taking care of his laundry and mending, and cheering him with class-made cakes and other foods, and with friendly letters.

The ten minerals which the War Department lists as strategic—meaning that the United States cannot expect to produce them in sufficient quantities for industrial or wartime needs—are manganese, nickel, chromium, tungsten, tin, aluminum, antimony, mercury, platinum, and mica.

Gauge Countersinks Screws

[*Continued from page* 108]

head on the gauge to the cut at intervals and you can tell at a glance when to stop the countersink for a perfect job. The gauge is easily made, consisting merely of a square or rectangular piece of metal with filed corners. To these corners are soldered different sized flat screw heads. The bodies of these screws are cut off after soldering. The screw head corresponding in size to those being used in the project at hand is used to gauge the depth of the countersink. A hole drilled in the middle of the gauge permits hanging.—*W. C. W.*

Cocoanuts To You!

[*Continued from page* 89]

inside aluminum or white. Mount a porcelain socket on a small wood block with a spring steel clip behind so that it may be snapped onto the back of a chair or the bed headboard. This shade also has a hole just large enough to make a snug fit for the bulb neck. The opening in the front end should be a little larger, but not much. The shade permits a good reading light over a restricted area.

Cocoanut Shell Flower Pot

This flower pot is especially appropriate for single, tallish plants. One end is cut off to form a hole about 2 inches in diameter and the meat is removed down half way or a little farther. The rest is left in the shell to serve as fertilizer.

Turn three flat head screws part way into the bottom (after drilling small holes for them to prevent cracking the shell) and then cast a plaster of Paris base about them, using a can or jar lid or other suitable receptacle, for the form. Leave the outside of the shell natural. Fill with earth up to within 1 inch of the top.

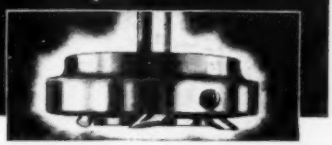
An alternative of this flower pot idea is to prepare the shell as above described, then turn two small screweyes into points just above center, on opposite sides and hang plant and pot from two brass chains by the window.

A Hand Made Hunting Knife

[*Continued from page* 93]

¾x1x1⅛-in., rough grind the end knob to shape. Drill and tap as shown for ¼-in. threads. Countersink both ends of this hole. Now force the hilt on the handle section and then add the leather pieces. Tighten the knob, using an end wrench until the leather pieces are compressed tightly. Now grind off the leather of the handle to the shape of the hand. File the knob to shape and then finish as with the hilt.—*Ralph T. Moore.*

AT LAST!
A COMBINATION HI-SPEED
WOOD PLANER and FINISHER
FITS ANY DRILL PRESS
$7.50 COMPLETE



PLANES, FINISHES and PARALLELS
ALL WOODS and PLASTICS—
Eliminates Sanding and Hand Planing

Now you can plane the trickiest grains—the toughest woods and plastics with sensational ease and accuracy in a tenth the time—and without effort. No scratching, gouging, marking or rough surfaces—no chipping or feathering. All surfaces agate smooth. Simply turn on the power—insert in ¼ h.p. (or larger) drill press chuck—guide the work piece through by hand—and for example in 30 seconds you have a board 2 ft. x 8 in. completely surfaced and finished. It's as easy as that—absolutely safe and accurate to within .002 inches. Takes all standard widths. An exceptionally low cost life time tool. Eliminates hand or mechanical planing and sanding. Unexcelled for home workshop and industrial use.

—FREE TRIAL MONEY BACK GUARANTEE—
We will ship parcel post prepaid any place in U.S.A. on receipt of check, money order or C.O.D. order. If not 100% satisfied, we will positively guarantee full refund. Try it and be convinced. You risk nothing. Or see your nearest dealer!

FREE ILLUSTRATED LITERATURE
BERRY TOOL COMPANY, 321 Architects Bldg., Detroit, Michigan

BERRY HI-SPEED ROTARY WOOD PLANER

Print Your Own
Cards, Stationery, Advertising, labels, paper, circulars, tags, etc. Save money and time. Sold direct from factory only. Junior Outfit $9.00. Senior outfits $17 and up. Do popular raised printing like engraving with any of our presses.
Print for Others, Big Profits
Pays for itself in a short time. Easy rules sent. Write for free catalog of outfits and all details.
KELSEY PRESSES, D-9, Meriden, Conn.

PUSH-BUTTON CONTROLLED
GAS TANK LOCK
A new invention SNAP-UP "ELECTRIC HAMMER ACTION" obsoletes all other gas caps. ELIMINATES TROUBLESOME KEYS. STOPS LOSS OF GAS AND CAPS. Features PUSH-BUTTON CONTROL FROM DASH—STREAMLINE DESIGN. A fast selling—high quality product at a NEW LOW PRICE. year guarantee. If your dealer cannot supply you, order direct. Distributors, dealers, HERE IS YOUR MONEY MAKING OPPORTUNITY. WRITE NOW for descriptive literature.
SNAP-UP GAS CAP CO., INC., DEPT. 3, ASHLAND, KY.

We have Everything
PHOTOGRAPHIC New or Used
at attractive Prices
1890 — 50 Years — 1940
of PHOTOGRAPHIC Experience
Camera Enthusiasts the world over have made us their headquarters. Why not make it yours? Intelligent Prompt Service—In Commemoration—Special Prices are being quoted on all equipment (new or used).
Address letters to Dept. MX5.
TRADE-INS Accepted—"Service Is Our Motto"
CAMERA EXCHANGE ORIGINATORS SINCE 1890
NEW YORK CAMERA EXCHANGE
116 FULTON ST. NEW YORK

WORLD'S BIGGEST THRILLS!

WE GUARANTEE you'll never find a thrill-value equal to MASTER COMICS, World's Biggest Comics Book.

GIANT PAGES, alive with bright color, sparkle with the spine-tingling picture stories of MASTER MAN . . DEVIL'S DAGGER . . FRONTIER MARSHAL . . SHIP-WRECK ROBERTS . . and a host of other rollicking, roving two-fisted heroes.

GIANT THRILLS on every one of the world's biggest comics pages make MASTER COMICS the world's biggest money's worth of ACTION . . ADVENTURE . . EXCITE-MENT.

And GIANT TYPE makes MASTER COMICS the easiest magazine in the world to read.

NO WONDER thousands of new read-ers every day are calling MASTER COMICS—world's biggest comics book—"the world's best."

GET YOUR COPY TODAY

MASTER COMICS

WORLD'S BIGGEST COMICS BOOK
ON SALE AT ALL NEWSSTANDS

Build An Adobe Bird House

[*Continued from page* 109]

Two openings, 1¼-in. and 2¼-in. square are cut in the front of the lower larger box. If the houses are to be used for wrens, make the openings round, 1-in. in diameter. The platform consists of boards fastened together on the underside with cleats. The Indian well is a small saucer or tin, surrounded by putty or plaster, two or three nails through the platform embedded in the putty or plaster to hold it in place. Set a 4-by-4 post 12 feet long in the ground to hold the bird house securely.—*E. V. H.*

Melodious Pipe Chimes

[*Continued from page* 109]

hole to take the small iron rod uprights. The rod is bent to form a rectangle 14x18-in. with the ends thrust into the base and glued. Use broom wire or similar wire for hanging the chimes to the top bar, wrapping a few turns around the pipe to secure it and twisting the other end of the wire around the rod. Keep the upper ends of the pipes the same distance from the rod, to present a neat appearance, and arrange the pipes from the longest at the left to the shortest at the right. Make a hardwood mallet head, 2-in. in diameter at the end and 3-in. long. Bore a hole in the side to take a handle 12-in. long, whittled from pine. Paint the mallet and chime set a bright red, or whatever color you may choose.—*E. V. H.*

Flagpole For The Beach Home

[*Continued from page* 106]

window, the stars should go clear to the head of the staff, unless at half-mast.

7. When flown at half-mast, it is first raised to the peak and lowered to the half-staff position. Before lowering, it is first returned to the peak. On Memorial Day it should be half-mast from sunrise till noon, and at full staff from noon until sunset.
8. When displayed against a wall the union should be uppermost or at the flag's right if vertically. This applies also to a window display.
9. In a procession with another flag or flags, it should be either at the right or in front of the center of the others. (See 10.)

The flag should be displayed only between sunrise and sunset.—*Hi Sibley.*

The automobile industry saved more than $10,000,000 by salvaging waste materials in 1939.

A machine for measuring the warmth of fabrics used in clothes and bedding has been devised.

Miniature House And Garden

[*Continued from page* 110]

of shears, or even tin snips, cut out the parts, keeping away from the lines. With a ruler and a new stiff-backed razor blade cut the edges neatly on your cutting card. Do not press too hard and—be careful. Five cuts should take you through.

The next step is to rule the windows, doors, etc., with India ink. When your wall pieces look like the ones in drawing, complete windows by ruling just inside these lines and filling in with a small brush. See house elevations.

Make all the bending cuts now and "peel" the flaps. You can leave the lawn in one piece or cut it as shown so the set will "pack," as you prefer. You are now ready to assemble.

Bend the wall pieces to shape and glue or cement the flaps in place. Place house on base-piece and glue inside as shown in sketch. Glue base to lawn and glue top edges of walls to take roof and peak. Bend chimney and glue in place. Blacken its top end as shown. Mount garage the same way.

India ink will represent black top walks and drive. For the flower beds, daub on thick water color paints, using your own ideas as to arrangement and color combinations. Another way to make flowers is to scrape chips off crayons with the end of razor blade onto squares of paper. Brush glue or paste where a certain color is wanted and sprinkle chips on. Tap bottom of card to spread them evenly. Blow off loose chips and apply next color and so on. This method is very effective.—*D. W. Clark.*

Wood Chain Lawn Fixture

[*Continued from page* 103]

The finished links will measure 3-in. wide and 6-in. long on the outside.

Four brackets are required for hanging the chains to the posts. These are also made of 1-in. material and are attached to the posts with two spikes. All of the dimensions for these brackets are given in the sketch. The brackets are spiked to the post six inches down from the top of the post. The toppers for finishing off the top of the posts are made of discs of wood sawed out of a 1-in. board. The horizontal disc is 6-in. in diameter and the vertical disc is 5-in. in diameter. They are nailed together as shown and then nailed to the top of the posts. The chain, brackets and toppers are made of white pine. The chains are simply hooked on the brackets and are readily removed to get them out of the way for mowing grass and for winter storage. The entire fixture is painted with outside white paint.

Farm families are the best-fed population group in the United States, village families the poorest fed, a survey shows.

HOT WATER with SPEED KING

From Any Electric Light Socket

Millions need SPEED KING—the amazing disc that you drop into any pan, pail or basin of water and plug into any 110-volt socket. CHEAP and FAST. Small in size.

SAMPLES for Agents - Send Name

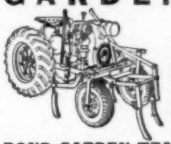
Write quick—for my SAMPLE OFFER—FREE! Get an actual sample SPEED KING for making demonstrations. You can make plenty of cash as my agent. HURRY! Send no money! —Just your name. L. B. Patterson, Pres.

NU-WAY CO., Des Moines, Iowa. Dept. 625, Walnut Bldg.

60-SECOND Demonstration

GARDEN TRACTORS

● SPEEDEX ●



Built to give years of service. Hundreds in use. Low Factory to User Prices. Several models available. 5-H.P. Riding type also Walking types in Three sizes. Light Power Cultivator now only $77.50. Write for Free Illustrated folder.

POND GARDEN TRACTOR CO., Box 175, Ravenna, O.

Re-String Rackets at Home

● EARN MONEY ●

WITH THE WONDER VISE

It's pleasant, profitable work. No experience or skill required. Easy to learn. Full line of guaranteed Stringing Tools, Frames, Gut and Silk Strings. Every item high quality.

FREE

Write for our 1940 Catalog and Instruction Sheet.

W. A. BICKEL & CO.

137 N. Marion, Dept. B-50, Oak Park, Ill.

HOME WORKSHOP FANS!

The new HOW TO BUILD IT (No. 7) is packed with useful and fascinating home workshop projects, suitable for experts and beginners alike. A lavishly illustrated, 146-page book, this is the handiest, most satisfactory and least expensive book of its kind ever to be offered to the home workshop enthusiast. 50 cents at your newsstand, or postpaid from Fawcett Publications, Inc., Greenwich, Conn.

HANDEE

Tool of 1001 Uses

A WHOLE TOOL SHOP IN YOUR HAND

Save Hours of Hand Work

Smooth, steady power at your finger tips. Uses 300 accessories to grind, drill, polish, rout, cut, carve, sand, saw, sharpen, engrave, etc. Plugs in any AC or DC socket.

10 Days Money-Back Trial

Order today. Standard Model (illustrated) 18,000 r.p.m. 16 oz. $10.75 postpaid with 3 Accessories . . . DeLuxe Model 25,000 r.p.m. 12 oz. $18.50 postpaid with 6 Accessories.

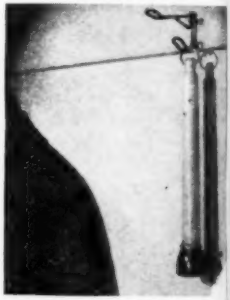
FREE 64-Page Catalog

Complete information on Handee Products and their wide application in crafts work and industry all over the world.

Chicago Wheel & Mfg. Co. 1101 W. Monroe St., Dept. MI Chicago, Ill.

New Ideas for Home & Shop

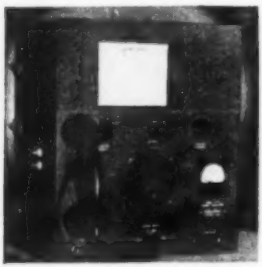
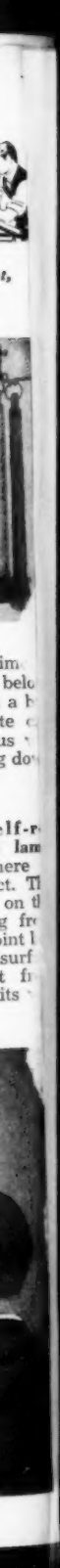
Names and addresses of manufacturers of products described below will be sent free to any reader on request, provided a stamped, return envelope accompanies the inquiry. Mention date of issue when writing.



Those dark closet corners can be probed with the convenient new light at right. Its barrel is of wood with a natural finish, while the globe is translucent plastic in various colors. A flashlight battery furnishes the "juice" and a ring on the end permits it to be hung in closet.

New insurance against expensive overtim long distance telephone calls is the gadget belo A touch of the lever starts the device and a b will ring 15 seconds before the 3-minute c period elapses. In addition, the apparatus t time a call of any duration thereby keeping do your overtime charges.

Amateur photographers who have been seeking a low-cost versatile enlarger will probably find the one illustrated above ideal. It is sturdily built, with laminated baseboard, nickeled upright and die-cast aluminum bracket arm. It will take negatives from 35 mm. to postcard size, and lenses can be interchanged. A specially designed lamp housing gives positive, even illumination over the whole negative area. The enlarger is supplied with a 4-inch f. 11 lens as standard equipment.

Black necked self-r flecting photoflood lam now keeps light where belongs—on the subject. Th black opaque coating, on th outside and extending fr the lamp's base to a point b yond the reflecting surf prevents stray light fr escaping and finding its w into the camera lens.

A new and extremely compact 25-watt marine radiophone for use on small commercial and pleasure boats is now in production. It provides for 2-way communication with other boats, land telephone and Coast Guard stations, adding materially to the safety and convenience of boat operation. Power can be drawn from the boat's battery or, 110 a.c. volt line.